OPIC
OFFICE DE LA PROPRIÉTÉ INTELLECTUELLE DU CANADA

CIPO
CANADIAN INTELLECTUAL PROPERTY OFFICE

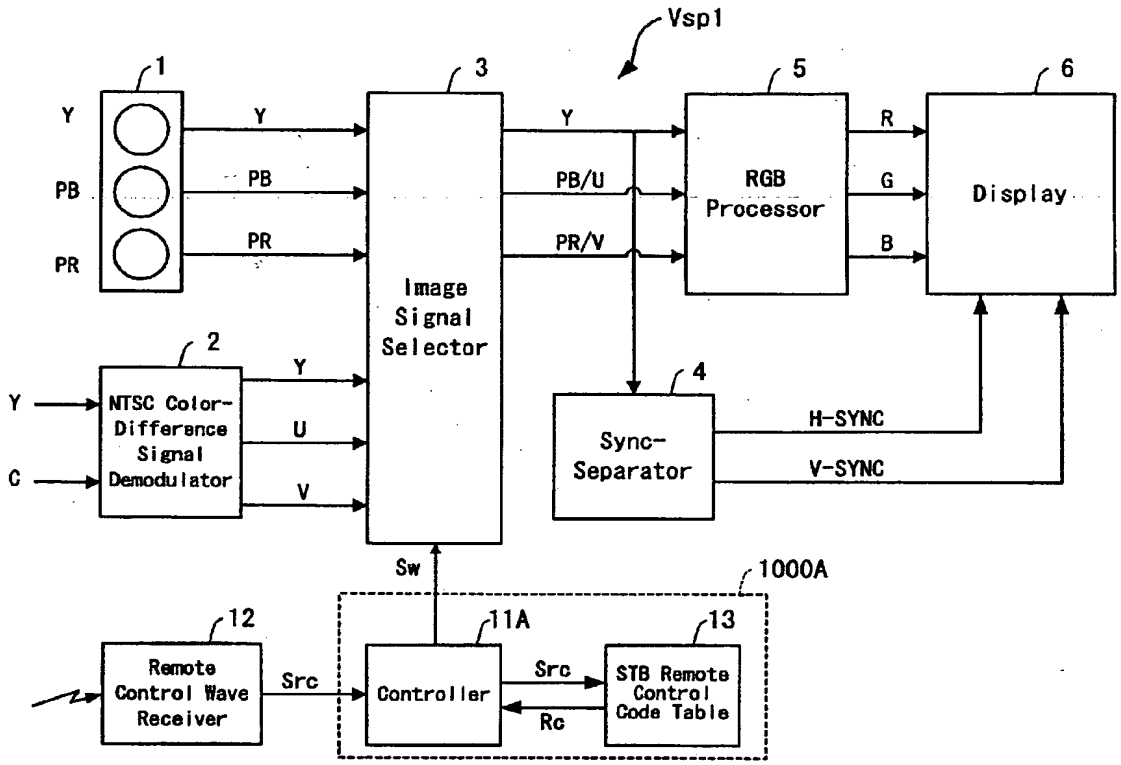
(12) (19) (CA) **Demande-Application**

(21) (A1) **2,314,977**
(86) 1999/10/12
(87) 2000/04/20

(72) UNEMURA, TOYOAKI, JP
(71) MATSUSHITA ELECTRIC INDUSTRIAL CO., LTD., JP

(51) Int.Cl.[7] H04N 5/44, H04N 5/46, H04N 9/00, H04N 5/00
(30) 1998/10/15 (10/293519) JP

(54) **COMMUTATEUR POUR SIGNAUX VIDEO COMPOSANTS**
(54) **COMPONENT VIDEO SIGNAL SWITCH**



(57) Des instructions (Src, Rc) transmises à partir d'une seule commande à distance activent une première source de signaux externe (STB) et une seconde source de signaux interne (NTSC, 2). Un commutateur pour signaux vidéo composants (Vsp) effectue une commutation entre un premier signal vidéo composant (Scvl) émanant d'un terminal d'entrée (1) connecté à la première source de signaux (STB) et un second signal vidéo composant (Scv2) émanant de la seconde source de signaux (NTSC, 2), et présente une image sur un dispositif d'affichage (6). Le récepteur à commande à distance (12) reçoit les instructions (Src, Rc). Un

(57) Commands (Src, Rc) transmitted from a single remote control activates a first external signal source (STB) and a second internal signal source (NTSC, 2), and a component video signal switch (Vsp) switches between a first component video signal (Scv1) from an input terminal (1) connected with the first signal source (STB) and a second component video signal (Scv2) from the second signal source (NTSC, 2), and presents an image on a display device (6). The remote-command receiver (12) receives the command (Src, Rc). A video signal switch (3) supplies selectively either of the first and second component video signals (Scv1, Scv2) to the

OPIC
OFFICE DE LA PROPRIÉTÉ INTELLECTUELLE DU CANADA

CIPO
CANADIAN INTELLECTUAL PROPERTY OFFICE

(21) (A1) **2,314,977**
(86) 1999/10/12
(87) 2000/04/20

commutateur pour signaux vidéo (3) transmet sélectivement les premiers et seconds signaux vidéo composants (Scv1, Scv2) au dispositif d'affichage (6). Une commande de commutation pour signaux vidéo composants (1000A) commande la commutation des signaux vidéo (3) pour sélectionner les premiers ou les seconds signaux vidéo composants (Scv1, Scv2), suivant ceux qui sont associés à l'instruction reçue (Src, Rc).

display device (6). A component video signal switch control (1000A) controls the video signal switch (3) to select the first or second component video signal (Scv1, Scv2), whichever is associated with the received command (Src, Rc).

SPECIFICATION

COMPONENT VIDEO SIGNAL SWITCHING DEVICE

TECHNICAL FIELD

The present invention relates to a component video signal switching device selectively switching component video signals inputted to a display device such as a television receiver to display pictures thereon.

BACKGROUND ART

FIG. 28 shows the schematic structure of a conventional component video signal switching device which is installed in the television receiver such as an HDTV receiver. The conventional component video signal switching device Vsc includes an input terminal 1, an NTSC color-difference signal demodulator 2, an image signal selector 3, a sync-separator 4, an RGB processor 5, and a display 6.

To the input terminal 1, a first component video signal Scv1 including a luminance signal Y, a color-difference signal PB, and a color-difference signal PR is supplied from external video/audio data sources typified by STB (Set-top Box) for digital television and DVD (Digital Video Disk) player. The input terminal 1 then outputs each of the luminance signal Y, the color-difference signal PB, and the color-difference signal PR

composing the first component video signal Scv1 to the image signal selector 3.

The NTSC color-difference signal demodulator 2 generates a second component video signal Scv2 composed of a luminance signal Y, a color-difference signal U (= B - Y), and a color-difference signal V (= R - Y) from the luminance signal Y and a chroma signal C obtained on the basis of a composite video signal of a type of various TV broadcasting standards (in this example, NTSC system). Each of the luminance signal Y, the color-difference signal U, and the color-difference signal V in the generated second component video signal Scv2 is outputted to the image signal selector 3. Note that the luminance signal Y and the chroma signal C supplied to the NTSC color-difference signal demodulator 2 are obtained, for example, from an output of a Y-C separator (not shown) after Y/C-separation of an NTSC composite video signal, or from an output of a so-called S-terminal of a video tape recorder.

The image signal selector 3 selectively outputs either the first component video signal Scv1 (Y, PB, PR) supplied from the input terminal 1 or the second component video signal Scv2 (Y, U, V) supplied from the NTSC color-difference signal demodulator 2. Note that the selection of the component video signal in the image signal selector 3 is made on the basis of a selection signal Sw externally supplied thereto.

The sync-separator 4 is configured by a sync-separating

circuit and separates a horizontal synchronization signal H-SYNC and a vertical synchronization signal V-SYNC included in the luminance signal Y of either the first or second component video signal Scv1 or Scv2 outputted from the image signal selector 3 to extract each signal for output.

The RGB processor 5 is structured by an RGB demodulating circuit to demodulate either the first component video signal Scv1 (Y, PB, PR) or the second component video signal Scv2 (Y, U, V) into original color signals of R, G, and B for output.

The display 6 displays the image based on the color signals of R, G, and B received from the RGB processor 5.

Hereinafter, the operation of the component video signal switching device Vsc for selectively switching the component video signal is briefly described. A user operates a remote controller (not shown) to provide the selection signal Sw as an instruction to the image signal selector 3. Based on the provided selection signal Sw, the image signal selector 3 selects either one of the first component video signal Scv1 or the second component video signal Scv2 and outputs the selected signal to the RGB processor 5.

In a case where the externally provided component video signal source such as a digital television STB and DVD player (hereinafter referred to as "external component video signal source") is connected to the input terminal 1, the image signal selector 3 outputs, based on the selection signal Sw, the first

component video signal Scv1 supplied from the input terminal 1. In other cases, the image signal selector 3 outputs the second component video signal Scv2 supplied from the NTSC color-difference signal demodulator 2 based on the selection signal Sw. The luminance signal Y included in the first or second component video signal Scv1 or Scv2 that comes out through the image signal selector 3 for input to the RGB processor 5 is supplied to the sync-separator 4.

The sync-separator 4 separates the horizontal synchronization signal H-SYNC and the vertical synchronization signal V-SYNC in the supplied luminance signal Y to extract each signal. The extracted synchronization signals H-SYNC and V-SYNC are supplied to a deflector (not shown) in the display 6.

Further, the RGB processor 5 receives the first component video signal Scv1 (Y, PB, PR) or the second component video signal Scv2 (Y, U, V) from the image signal selector 3 and demodulates the received signal into original color signals of R, G, and B. The demodulated signals are supplied to the display 6.

As such, in both cases where the first component video signal Scv1 (Y, PC, PR) is inputted through the input terminal 1 and where the luminance signal Y and the chroma signal C is received by the NTSC color-difference signal demodulator 2, the display 6 is capable of displaying colored images.

The above described input terminal 1, however, is so far provided only on the HDTV receiver as a component video input

terminal. In addition, since such component video input terminal is provided basically for receiving baseband HDTV signals, the actual use thereof may not be so frequent.

Nowadays, however, the signal sources complying with such component video input terminal such as DVD player and digital television (DTV) Set-top Box are eventually put to practical use. Even so, such devices (component video signal sources) connected to the component video input terminals (input terminal 1) are required to be controlled by remote controllers provided individually for each device, resultantly increasing bothersome operation.

From the point of view of the television broadcasting services in particular, currently-mainstream terrestrial analog broadcasts are eventually superseded by terrestrial digital broadcasts which have started globally around the end of 1998. The terrestrial digital broadcasts are assumed to be comparable to the terrestrial analog broadcasts within the next few years, and after that, the analog broadcasts will no longer be available. In such period of transition of the broadcasting from analog to digital, appropriate support is often not provided for the television receivers.

As it was for the conventional television receiver, if the component video input terminal is provided only for the purpose of connecting the DTV-STB thereto, such bothersome operation as described below is required. That is, even if trying to utilize

the DTV-STB with a television receiver remote controller, it is required to select the video input terminal by the television receiver remote controller first, and then a DTV channel by using a DTV-STB remote controller. This means that two remote controllers are required to be operated separately. Further, if the DTV-STB is incorrectly connected or if the DTV-STB is not turned on, the valid first component video signal is not supplied. As a result, on the display, erroneous images or totally blackout screen may be displayed. The user may, in confusion, take such cases as the device failure and may be interrupted from an appropriate operation.

An object of the present invention is to provide a component video signal switching device capable of, when different types of component video signals Scv are inputted from a plurality of external component video signal sources such as digital television STBs and DVD players as being the video signal sources, selectively switching the input source and selecting the channel of the external component video signal source with a single remote controller.

DISCLOSURE OF THE INVENTION

The present invention has the following features to achieve the above object.

The first aspect of the present invention is directed to a component video signal switching device for selectively

switching, based on a command linked with an externally provided first signal source and an internally provided second signal source and transmitted from a single remote controller, between a first component video signal inputted from a first input device which is connected to the first signal source and a second component video signal inputted from the second signal source for displaying an image on a display, comprising:

a component video signal selector for selectively outputting the first and second component video signals to the display;

a command receiver for receiving the command; and

a controller for controlling the selector to select one of the first and second component video signals that is having a link with the received command, wherein

the component video signal is switched by the minimum number of commands.

As described above, in the first aspect of the present invention, the component video signals supplied from the external signal source and the internal signal source can be switched by the single remote controller.

According to a second aspect of the present invention, in the first aspect, the controller includes an aspect ratio detector for detecting an aspect ratio of the image carried on the selected component video signal, and

adjusts any one of vertical and horizontal deflection

angles of the display based on the detected aspect ratio to display the image properly.

As described above, in the second aspect, an image can be properly displayed even when switching between the component video signals each having the different aspect ratio takes place.

According to a third aspect of the present invention, in the first aspect, the controller includes a connection determination device for determining a connection status between the first input device and the first component video signal source, and

when determined by the connection determination device that the connection status is non-connection, the controller controls the selector to select the second component video signal.

As described above, in the third aspect, if the external signal source is not correctly connected, the first component video signal is forcefully selected even if a user is selecting the first component video signal, thereby enabling the continuous image display on the display.

According to a fourth aspect of the present invention, in the first aspect, the controller includes an aspect ratio detector for detecting an aspect ratio of the image carried on the selected component video signal,

when the connection determination device detects that the connection status is non-connection, the controller controls the selector to select the second component video signal, and adjusts

any one of vertical and horizontal deflection angles of the display to display the image properly.

As described above, in the fourth aspect, the effects achieved by the second and third aspects can be obtained at the same time.

According to a fifth aspect of the present invention, in the first aspect, the controller includes a component video signal determination device for determining validity of the first component video signal based on a horizontal synchronization signal and a vertical synchronization signal included in the first component video signal, and

when the component video signal determination device determines the signal as being invalid, the controller controls the selector to select the second component video signal.

As described above, in the fifth aspect, if the valid first component video signal in not supplied, the second component video signal is forcefully selected even if a user is selecting the first component video signal, thereby enabling the continuous image display on the display.

According to a sixth aspect of the present invention, in the fifth aspect, the controller further includes an aspect ratio detector for detecting an aspect ratio of the image carried on the selected component video signal, and

when the component video signal determination device determines the signal as being invalid, the controller controls

the selector to select the second component video signal, and adjusts any one of vertical and horizontal deflection angles of the display based on the detected aspect ratio to display the image properly.

As described above, in the sixth aspect, the effects achieved by the above described second and fifth aspects can be obtained at the same time.

According to the seventh aspect of the present invention, in the third aspect, the controller includes a component video signal determination device for determining validity of the first component video signal based on a horizontal synchronization signal and a vertical synchronization signal included in the first component video signal, and

when the component video signal determination device determines the signal as being invalid, the controller controls the selector to select the second component video signal even if the connection determination device detects a connection.

As described above, in the seventh aspect, the effects achieved by the above described third and fifth aspects can be obtained at the same time.

According to an eighth aspect of the present invention, in the seventh aspect, the controller further includes an aspect ratio detector for detecting an aspect ratio of the image carried on the selected component video signal, and

when the component video signal determination device

determines the signal as being invalid, the controller controls the selector to select the second component video signal even if the connection determination device detects a connection, and adjusts any one of vertical and horizontal deflection angles of the display based on the detected aspect ratio to display the image properly.

As described above, in the eighth aspect, the effects achieved by the above described second and seventh aspects can be obtained at the same time.

According to a ninth aspect of the present invention, in the first aspect, the controller includes a selection restriction device for restricting control on the selector based on the received command.

As described above, in the ninth aspect, the function of switching between the component video signals supplied from the external signal source and the internal signal source can be made invalid.

According to a tenth aspect of the present invention, in the third aspect, the controller includes a first message display for outputting a first message corresponding to the result of the connection status determination by the connection determination device.

As described above, in the tenth aspect, if the external signal source is not correctly connected, a user is so notified by the message when selecting the first component video signal.

According to an eleventh aspect of the present invention, in the seventh aspect, the controller includes a second message display for outputting a second message corresponding to the result of the connection status determination by the connection determination device.

As described above, in the eleventh aspect, if the external signal source is correctly connected but the valid first component video signal is not being supplied, a user is so notified by the message when selecting the first component video signal.

According to a twelfth aspect of the present invention, in the first aspect, the device further comprising:

a first power supply device for driving the controller and the command receiver, and

a second power supply device for driving the component video signal switching device entirely at the time when the controller controls the selector to select any one of the component video signals, wherein

power consumption is reduced in a case where switching between the component video signal is not required.

According to a thirteenth aspect of the present invention, in the first aspect, the first signal source is a set-top box and the second signal source is an NTSC broadcast wave.

According to a fourteenth aspect of the present invention, in the first aspect, the remote controller stores the commands linked with the first and second component video signals.

A fifteenth aspect of the present invention is directed to a display for displaying a signal image, wherein

the component video signal switching device as claimed in claim 1 is incorporated.

A sixteenth aspect of the present invention is directed to a component video signal switching method for selectively switching, based on a command linked with an externally provided first signal source and an internally provided second signal source and transmitted from a single remote controller, between a first component video signal inputted from a first input device which is connected to the first signal source and a second component video signal inputted from the second signal source for displaying an image on a display, comprising:

a command reception step of receiving the command;

a link determination step of determining with which of the first and second component video signals the received command has a link; and

a selection step of selecting one of the first and second component video signals that is determined to have a link in the link determination step.

As described above, in the sixteenth aspect, the component video signals supplied from the external signal source and the internal signal source can be switched by the single remote controller.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram showing the structure of a component video signal switching device according to a first embodiment of the present invention.

FIG. 2 is a block diagram showing the detailed structure of a controller shown in FIG. 1.

FIG. 3 is a flowchart showing the major operation of the component video signal switching device shown in FIG. 1.

FIG. 4 is a flowchart showing a detailed operation in a STB key processing subroutine shown in FIG. 3.

FIG. 5 is a block diagram showing the structure of a component video signal switching device according to a second embodiment of the present invention.

FIG. 6 is a flowchart showing the major operation of the component video signal switching device shown in FIG. 5.

FIG. 7 is a flowchart showing a detailed operation in an aspect ratio adjustment subroutine shown in FIG. 6.

FIG. 8 is a diagram exemplarily illustrating an aspect ratio adjustment according to the present invention.

FIG. 9 is a diagram showing another example of the aspect ratio adjustment according to the present invention, which differs from the example in FIG. 8.

FIG. 10 is a block diagram showing the structure of a component video signal switching device according to a third embodiment of the present invention.

FIG. 11 is a block diagram showing the detailed structure of a controller shown in FIG. 10.

FIG. 12 is a flowchart showing the operation of the component video signal switching device shown in FIG. 10.

FIG. 13 is a is a block diagram showing the structure of a component video signal switching device according to a fourth embodiment of the present invention.

FIG. 14 is a flowchart showing the major operation of the component video signal switching device shown in FIG. 13.

FIG. 15 is a is a block diagram showing the structure of a component video signal switching device according to a fifth embodiment of the present invention.

FIG. 16 is a flowchart showing the major operation of the component video signal switching device shown in FIG. 15.

FIG. 17 is a flowchart showing a detailed operation in a valid video signal detection/STB key processing subroutine shown in FIG. 16.

FIG. 18 is a block diagram showing the structure of a component video signal switching device according to a sixth embodiment of the present invention.

FIG. 19 is a flowchart showing the major operation of the component video signal switching device shown in FIG. 18.

FIG. 20 is a block diagram showing the structure of a component video signal switching device according to a seventh embodiment of the present invention.

FIG. 21 is a flowchart showing major a operation of the component video signal switching device shown in FIG. 20.

FIG. 22 is a flowchart showing a detailed operation in an input source automatic switching selection subroutine shown in FIG. 21.

FIG. 23 is a diagram illustrating an automatic setting method in the input source automatic switching selection subroutine shown in FIG. 21.

FIG. 24 is a block diagram showing the structure of a component video signal switching device according to an eighth embodiment of the present invention.

FIG. 25 is a flowchart showing the operation of the component video signal switching device shown in FIG. 24.

FIG. 26 is an illustration showing an example of a message displayed in a first warning message display subroutine in the flowchart shown in FIG. 25.

FIG. 27 is an illustration showing an example of a message displayed in a second warning message display subroutine in the flowchart shown in FIG. 25.

FIG. 28 is a block diagram showing the structure of a conventional component video signal switching device.

BEST MODE FOR CARRYING OUT THE INVENTION

To explain the present invention in more detail, descriptions are made referring to the attached drawings.

(First Embodiment)

Hereinafter, a component video signal switching device according to a first embodiment of the present invention is described referring to FIGS. 1, 2, 3, and 4.

FIG. 1 shows a functional block diagram of a component video signal switching device Vsp1 according to this embodiment. The component video signal switching device Vsp1 includes: an input terminal 1; an NTSC color-difference signal demodulator 2; an image signal selector 3; a sync-separator 4; an RGB processor 5; a display 6; a first controller 11A; a remote control wave receiver 12; and an STB remote control code table 13.

The input terminal 1 receives a first component video signal Scv1 including a luminance signal Y, a color-difference signal PB, and a color-difference signal PR outputted from external component video signal sources typified by digital television STB and DVD player. The input terminal 1 then supplies each of the luminance signal Y, the color-difference signal PB, and the color-difference signal PR included in the first component video signal Scv1 to the image signal selector 3.

The NTSC color-difference signal demodulator 2 generates a second component video signal Scv2 including a luminance signal Y, a color-difference signal U (= B - Y) and a color difference-signal V (= R - Y) from the luminance signal Y and a chroma signal C obtained on the basis of a composite video signal of a type of various TV broadcasting standards typified by NTSC system. Each

of the luminance signal Y, the color-difference signal U, and the color-difference signal V included in the generated second component video signal Scv2 is outputted to the image signal selector 3. Note that the luminance signal Y and the chroma signal C supplied to the NTSC color-difference signal demodulator 2 are obtained, for example, from an output of a Y-C separator (not shown) after Y-C separation of an NTSC composite video signal, or from an output of a so-called S-terminal of a video tape recorder.

The image signal selector 3 selectively outputs either one of the first component video signal Scv1 (Y, PB, PR) supplied from the input terminal 1 or the second component video signal Scv2 (Y, U, V) supplied from the NTSC color-difference signal demodulator 2 based on a selection signal Sw supplied from the first controller 11A. The selection signal Sw is the two-level signal having the high-level and the low-level. The image signal selector 3 is structured to select the input terminal 1 when the selection signal Sw is at the high-level, and to select the NTSC color-difference signal demodulator 2 when the selection signal Sw is at the low-level.

The sync-separator 4 is configured by a sync-separating circuit and separates a horizontal synchronization signal H-SYNC and a vertical synchronization signal V-SYNC included in the luminance signal Y in either the first or second component video signal Scv1 or Scv2 outputted from the image signal selector 3

to extract each signal for output.

The remote control wave receiver 12 receives a remote control wave transmitted from a user-operated remote controller and outputs a digital code Src carried on the remote-control wave to the first controller 11A.

The STB remote control code table 13 stores remote control codes for the DTV-STB. The first controller 11A checks the digital code Src received from the remote control wave receiver 12 against the remote control codes stored in the STB remote control code table 13, and extracts a remote control code Rc that reflects the user's intention therefrom. Then, the first controller 11A generates and outputs the selection signal Sw reflecting the user's intention to the image signal selector 3 for selectively switching the component video signal Scv to be outputted therefrom.

The first controller 11A and the STB remote control code table 13 thus make up a first component video signal switching controller 1000A.

The RGB processor 5 is structured by an RGB demodulating circuit to demodulate either one of the first component video signal Scv1 (Y, PB, PR) or the second component video signal Scv2 (Y, U, V) into original color signals of R, G, and B for output to the display 6 based on the horizontal synchronization signal H-SYNC and the vertical synchronization signal V-SYNC supplied from the sync-separator 4.

The display 6 is preferably implemented by a CRT and displays the image based on the color signals of R, G, and B received from the RGB processor 5.

The structure of the first controller 11A is shown in FIG. 2. The first controller 11A includes a remote control code register 110a, a processor 110b, and a set remote controller table 110c. The remote control code register 110a stores the digital code Src inputted from the remote control wave receiver 12. The set remote controller table 110c stores custom codes determined for each remote controller.

The processor 110b determines, based on the custom codes stored in the set remote controller table 110c for the different types of remote controllers, whether or not the received digital code Src is a code for the DTV-STB. If the determination is yes, the processor 110b checks the digital code Src against the remote control codes stored in the STB remote control code table 13. If any remote control code Rc matches the received digital code Src, such remote control code RC is retrieved by the processor 110b.

The processor 110b outputs the selection signal Sw based on the remote control code Rc retrieved from the STB remote control code table 13 for selectively switching the component video signal Scv to be outputted from the image signal selector 3 to the RGB processor 5.

That is, in the present invention, when the user selects, by using the remote controller, the external component video

signal source such as an STB or DVD, the image signal selector 3 is automatically controlled so that the component video signal Scv to be received from the selected video/audio data source is selectively outputted therefrom. In other words, all that is needed for the user is to select, with the remote controller, any of program, channel, or contents that he/she desires to watch or listen. Then, the input system of the display device such as a television is automatically connected to the video/audio data source which provides the selected contents. As a result, it is not necessary to make settings individually for both of the video/audio data source and the display device as conventionally being done.

Next, by referring to a flowchart shown in FIG. 3, the operation of the component video signal switching device Vsp1 is described. The component video signal switching device Vsp1 is turned on to start the procedure.

First, in an initialization subroutine of step #100, the constituents of the component video signal switching device Vsp1 are initialized. Then the procedure advances to step #200.

In an STB key processing subroutine of step #200, when an instruction from the user-operated remote controller relates to the external component video signal source, processing for rendering the image signal selector 3 to output the first component video signal Scv1 supplied to the input terminal 1 is performed. When the instruction does not relate to the external

component video signal source, processing for rendering the image signal selector 3 to output the second component video signal Svc2 supplied from the NTSC color-difference signal demodulator 2 is performed. The STB key processing subroutine is described later in detail by referring to FIG. 4. The procedure then advances to step #700.

In step #700, the component video signal Scv outputted from the image signal selector 3 is subjected to general image processing for displaying the image on a television.

Now an exemplary operation in the above described step #200 is described in detail by referring to a flowchart shown in FIG. 4.

In step S202, the remote control wave receiver 12 receives the digital code Src transmitted from the remote controller and outputs the same to the first controller 11A. The remote control code register 110a in the first controller 11A stores the digital code Src supplied from the remote control wave receiver 12. The procedure then advances to step S204.

In step S204, the processor 110b determines whether or not the received digital code Src is a code for the DTV-STB by checking the digital code Src stored in the remote control code register 110a against the custom codes for various types of remote controllers which are recorded in the set remote controller table 110c. If determined "Yes", the procedure advances to step S206. If "No", processing in step #200 ends.

In step S206, the processor 110b compares the received digital code Src with each of the remote control codes stored in the STB remote control code table 13.

When the comparison result indicates that no remote control code stored in the STB remote control code table 13 matches the received digital code Src, the procedure in step #200 ends.

On the other hand, when any remote control code matches the received digital code Src, that is, when the instruction from the user-operated remote controller relates to the external component video signal source, the comparison result is determined as "Yes". Then the procedure advances to the next step S208.

In step S208, it is determined whether or not a switching flag Fsw is "1". The switching flag Fsw indicates which of the outputs, either from the input terminal 1 or from the NTSC color-difference signal demodulator 2, is now being selected in the image signal selector 3. Note that the switching flag Fsw is presumably set as "1" if the image signal selector 3 has selected the output from the input terminal 1, and set as "0" if the output from the NTSC color-difference signal demodulator 2 has been selected.

In the case of the switching flag Fsw indicates "1", that is, the image signal selector 3 is selecting the output from the input terminal 1, "Yes" is determined, and then the procedure ends. On the other hand, in the case of the switching flag Fsw indicates "0", that is, the image signal selector 3 is selecting the output

from the NTSC color-difference signal demodulator 2, "Yes" is determined and then the procedure advances to step S210.

In step S210, the processor 110b sets the selection signal Sw to the high-level and outputs the same to the image signal selector 3. As described above, the image signal selector 3 selects the input terminal 1 based on the selection signal Sw at the high-level. Then the procedure advances to next step S212.

In step S212, "1" is set to the switching flag Fsw to end the procedure.

Briefly described below is an actual example of the operation of the component video signal switching device Vsp 1 described above by referring to the flowcharts shown in FIGS. 3 and 4.

A user operates a remote controller to transmit an instruction relating to the contents of a program, or the like provided from a specific component video signal source to the component video signal switching device Vsp1. At this time, if the user is watching/listening a program of NTSC system using a conventional VCR, for example, the image signal selector 3 is being controlled so as to select the output from the NTSC color-difference signal demodulator 2 and output the same to the sync-separator 4 and the RGB processor 5.

To watch/listen a digital broadcast program right after watching/listening the contents using the VCR, the user is required to reselect, by the remote controller, the desired

component video signal source. At this time, in many display devices, selection of the video input is done through a toggle mechanism. It is thus required to press an input selection key many times until the desired component video signal source is selected for input therefrom. Contrarily, in the present embodiment, the user is only required to press a button corresponding to a desired function after selecting the DTV-STB by using the remote controller. By this operation, the digital code Src designating the function is transmitted to the remote control wave receiver 12.

The remote control wave receiver 12 receives the digital code Src and outputs the same to the first controller 11A. The first controller 11A compares the description of the received digital code Src and the remote control codes stored in the STB remote control code table 13. If the description of the digital code Src matches any one of the remote control codes, the first controller 11A immediately outputs the high-level selection signal Sw to the image signal selector 3 so that the first component video signal Scv1 (Y, PB, PR) outputted from the input terminal 1 can be selected therein.

In detail, the remote control code register 110a in the first controller 11A stores the digital code Src received from the remote control wave receiver 12. The processor 110b checks the digital code Src stored in the remote control code register 110a against the custom codes for various types of remote

controllers which are recorded in the set remote controller table 110c. If the received digital code Src is proved to be the DTV-STB code, the processor further compares the description of the digital code Src and the remote control codes Rc stored in the STB remote control code table 13. If the digital code Src is proved to be relating to the first component video signal Scv1 supplied from the external component video signal source, the processor 110b outputs the high-level selection signal Sw to the image signal selector 3. As a result, the sync-separator 4 and the RGB processor 5 are supplied with the first component video signal Scv1.

As described above, in the present invention, the second component video signal Scv2 of the conventional NTSC system is smoothly switched to the first component video signal Scv1 (Y, PB, PR) supplied from the DTV-STB for display on the display 6.

That is to say, the remote control code for the DTV-STB transmitted from an arbitrary remote controller activates the function of switching between the input signals supplied to the display device at the same time of operating the DTV-STB. Accordingly, the user can have smooth access to the DTV broadcasts, which is a new type of broadcasting system, and have fun.

In summary, in the component video signal switching device Vsp1 of the first embodiment of the present invention, when receiving a remote control code signal for the DTV-STB while the image signal selector 3 is selecting the NTSC color-difference

signal demodulator 2, the first controller 11A controls the image signal selector 3 to switch to the input terminal 1 side to receive the first component video signal Scv1 (Y, PB, PR).

(Second Embodiment)

A component video signal switching device according to a second embodiment of the present invention is described by referring to FIGS. 5, 6, and 7.

As shown in a block diagram of FIG. 5, in a component video signal switching device Vsp2 of the present embodiment, the first component video signal switching controller 1000A in the first component video signal switching device Vsp1 shown in FIG. 1 is replaced with a second component video signal switching controller 1000B.

The second component video signal switching controller 1000B has the structure in which an aspect ratio detector 100 is newly provided to the first component video signal switching controller 1000A. The aspect ratio detector 100 detects an aspect ratio of the image to be displayed by the first component video signal Scv1 based on the luminance signal Y in the first component video signal Scv1 which is inputted from the input terminal 1. The aspect ratio detector 100 then generates an aspect ratio signal Ra indicating the detected aspect ratio for output to the first controller 11A.

The aspect ratio detector 100 includes a slicer 100a, a

sync-separator 100b, and a data register 100c. The slicer 100a and the sync-separator 100b are supplied with the luminance signal Y of the first component video signal Scv1 from the input terminal 1. The sync-separator 100b extracts, from the incoming luminance signal Y, a vertical synchronization signal V-S and a horizontal synchronization signal H-S of the first component video signal Scv1 and outputs the signals to the slicer 100a. The slicer 100a slices the luminance signal Y inputted from the input terminal 1 based on the vertical synchronization signal V-S and the horizontal synchronization signal H-S inputted from the sync-separator 100b. The slicer 100a then calculates and outputs to the data register 100c the aspect ratio Ra of the image to be displayed by the first component video signal Scv1. The data register 100c temporarily stores the aspect ratio Ra and outputs the same to the first controller 11A at a predetermined timing.

Next, by referring to FIG. 6, the operation of the component video signal switching device Vsp2 is described. In the operational procedure of the second component video signal switching device Vsp2, an aspect ratio adjustment subroutine of step #300 is newly provided in between the STB key processing subroutine of step #200 and the general television image processing subroutine of step #700 in the flowchart shown in FIG. 3.

Therefore, in the component video signal switching device Vsp2, the procedure advances to step #300 after the above

described steps #100 and #200.

In step #300, the aspect ratio Ra of the first component video signal Scv1 is detected by the aspect ratio detector 100. Based on the detected aspect ratio Ra, an aspect ratio for image display on the display 6 (hereinafter referred to as "an aspect ratio of display 6") is adjusted so that the first component video signal Scv1 can be displayed on the display 6 with the correct aspect ratio. Then the procedure advances to the general television image processing subroutine of the next step #700.

Next, by referring to a flowchart shown in FIG. 7, the operation in the aspect ratio adjustment subroutine of the above described step #300 is described in detail.

First, in step S302, the aspect ratio Ra detected in the aspect ratio detector 100 is outputted from the data register 100c therein to the first controller 11A. That is, the aspect ratio Ra of the first component video signal Svc1 is read by the first controller 11A. Then the procedure advances to the next step S304.

In step S304, depending on the value of the aspect ratio Ra, the procedure branches therefrom. In this example, the procedure advances to step S306 when the aspect ratio Ra is 16 : 9. The procedure advances to step S308 when the aspect ratio Ra is 4 : 3 (NORMAL), and to step S310 when the aspect ratio Ra is 4 : 3 (LETTER BOX).

In step S306, a vertical or horizontal deflection angle of

the display 6 is adjusted so that the current state of the aspect ratio of the display 6 conforms to the aspect ratio of 16 : 9. Note that the normal aspect ratio of the display is 4 : 3. The procedure then ends.

In step S308, as the aspect ratio 4 : 3 conforms to that of the NTSC system, the vertical/horizontal deflection angle of display 6 is not adjusted in contrast to the case in step S306, and the procedure ends.

In step S310, as is the case in step S308, the aspect ratio is 4 : 3, and thus the vertical/horizontal deflection angle of display 6 is not adjusted, and the procedure ends.

Next, by referring to FIG. 8, adjustment of the aspect ratio of the display 6 in the above mentioned step S306 is briefly described. In the drawing, Ho1 and Vo1 respectively denote a horizontal length and a vertical length of the image on the display 6. In order to correctly display the first component video signal Svc1 having the aspect ratio of 16 : 9 on the display 6, the vertical deflection angle may be adjusted so as to shrink the vertical length Vo1 by 3/4 times to become Vm (compression).

In the above, the case where the aspect ratio is changed from 4 : 3 to 16 : 9 in step S306 is described. In the case of switching from the second component video signal Scv 2 to the first component video signal Scv1, on the contrary, the aspect ratio of the display 6 has to be changed from 16 : 9 to 4 : 3.

Adjustment of the aspect ratio in such case is described

by referring to FIG. 9. Shown in FIG. 9 is the adjustment performed when the aspect ratio of the display 6 is 16 : 9. In the drawing, Ho2 and Vo2 respectively indicate a horizontal length and a vertical length of the image on the display 6. Accordingly, Ho2 : Vo2 is 16 : 9. In order to correctly display the first component video signal Svc1 having the aspect ratio of 4 : 3 on the display 6, the horizontal deflection angle may be adjusted so as to shrink the horizontal length Ho2 by 3/4 times to become Hm (compression).

As described above, in the component video signal switching device Vsp2 of this embodiment, when receiving a digital code Src for the DTV-STB while the image signal selector 3 is set to select the output from the NTSC color-difference signal demodulator 2, the first controller 11A analyzes the digital code Src and compares the same with the contents of the DTV-STB remote control code table 13 which is internally provided. When any code in the STB remote control code table 13 matches the received digital code Src, the first controller 11A controls the image signal selector 3 to select the input terminal 1, to which the first component video signal Scv 1 (Y, PB, PR) is supplied from the external component video signal source.

Further, the first controller 11A determines the aspect ratio Ra of the image displayed by the first component video signal Scv1. The first controller 11A adjusts the horizontal deflection angle or the vertical deflection angle of the display 6 based on

the determined aspect ratio Ra. In such manner, control for correctly displaying the image of the first component video signal Scv1 is performed.

(Third Embodiment)

A component video signal switching device according to a third embodiment of the present invention is described by referring to FIGS. 10, 11, and 12.

As shown in a block diagram of FIG. 10, in a component video signal switching device Vsp3 of this embodiment, the first component video signal switching controller 1000A in the first component video signal switching device Vsp1 shown in FIG. 1 is replaced with a third component video signal switching controller 1000C.

In the third component video signal switching controller 1000C, the first controller 11A of the first component video signal switching controller 1000A shown in FIG. 1 is replaced with a second controller 11B, and a switch 15 is newly provided. The switch 15 is attached to the input terminal 1 and detects whether or not input cables from the external component video signal source are connected to respective terminals on the input terminal 1 provided for the luminance signal Y, the color-difference signal PB, and the color-difference signal PR. Thereafter, the switch 15 outputs a switch signal Ssw indicating the detection result to the second controller 11B.

The structure of the second controller 11B is shown in FIG. 11. The second controller 11B is newly provided with a switch port 110d in addition to the first controller 11A shown in FIG. 2. The switch port 110d generates, based on the switch signal Ssw inputted from the switch 15, a connection signal Scn indicating a connection status for each cable to be connected to the input terminal 1. The generated signal Scn is outputted to the processor 110b.

Next, by referring to a flowchart shown in FIG. 12, the operation of the component video signal switching device Vsp3 is described. In the flowchart of the drawing, step S1 of determining whether or not the input terminal 1 is being connected with the cables from the external component video signal source is inserted in between steps #100 and #200 in the flowchart shown in FIG. 3. Further, step S3 of outputting the selection signal Sw set at the low-level is provided in between steps S1 and #700.

As a result, in step S1, the second controller 11B determines whether or not the input terminal 1 and the external component video signal source are being connected with the cables based on the switch signal Ssw. If not connected, the determination is "No" and the procedure advances to step S3.

In step S3, the second controller 11B sets the selection signal Sw at the low-level and outputs the same to the image signal selector 3. The image signal selector 3, in response to the low-level selection signal Sw, selects the output from the NTSC

color-difference signal demodulator 2. The procedure then advances to the previously-mentioned step #700.

As described above, if it is determined "No" in step S1, in other words, if it is determined that the cables from the external component video signal source are not connected to the input terminal 1, the second component video signal Scv2 for the conventional NTSC system, which is the output from the NTSC color-difference demodulator 2, is forcefully selected for display even if the first component video signal Scv1 for the STB, which is the output from the input terminal 1, has been selected since the last time operation. With such configuration, if a problem such as bad connection occurs while a user is watching/listening the first component video signal Scv1 from the input terminal 1 side, the switching to the second component video signal Scv2 is automatically performed to selectively switch the picture on the display 6, thereby avoiding a sudden blackout of the display 6. Resultantly, the possibility of user's mistake of incorrectly recognizing the problem as the failure of the display device itself can be reduced.

On the other hand, if "Yes" is determined in step S1, that is, if it is determined that the cables from the external component video signal source are being connected to the input terminal 1, the procedure advances to #700 via #200. As a result, as explained by referring to FIG. 3, the component video signal Scv corresponding to the user's instruction by the remote controller

is displayed on the display 6.

Thereafter, the procedure returns to step S1 and the presence of any abnormal cable connection between the input terminal 1 and the external component video signal source is monitored therein. If any abnormal connection is found, the image signal selector 3 is controlled to keep on selecting the second component video signal Scv2 outputted from the NTSC color-difference signal demodulator 2. In other words, the operation of switching between the component video signals Svc is restrained when the external component video signal source is not connected to the input terminal 1.

As described above, in the component video signal switching device of this embodiment, the switch 15 as being connection determination means is provided to the input terminal 1. This is for the purpose of permitting the execution of the STB key processing subroutine of step #200 described in the first embodiment, only when the external component video signal source is being connected to the input terminal 1. Thereafter, the general television image processing subroutine of step #700 is executed so that the control for displaying, on the display 6, the image of either the first component video signal Scv1 or the second component video signal Scv2 is performed.

(Fourth Embodiment)

A component video signal switching device according to a

fourth embodiment of the present invention is described by referring to FIGS. 13 and 14. As shown in a block diagram of FIG. 13, in a component video signal switching device Vsp4 of the present embodiment, the third component video signal switching controller 1000C is replaced with a fourth component video signal switching controller 1000D.

In the fourth component video signal switching controller 1000D, the aspect ratio detector 100 found in the second component video signal switching controller 1000B as shown in FIG. 5 is provided in addition to the third component video signal switching device 1000C shown in FIG. 10.

Next, by referring to a flowchart shown in FIG. 14, the operation of the component video signal switching device Vsp4 is described. In the flowchart of the drawing, similarly to that described for the component video signal switching device Vsp3 according to the third embodiment, step S1 of determining whether or not the input terminal 1 is being connected to the cables from the external component video signal source is inserted in between steps #100 and #200 of the flowchart shown in FIG. 6. Further, step S3 of outputting, to the image signal selector 3, the selection signal Sw set at the low-level is provided in between steps S1 and #300.

As a result, as described by referring to FIG. 12, if it is determined that the external video signal source is not connected to the input terminal 1 in step S1, in step S3, the image

signal selector 3 is so set as to display the second component video signal Scv2.

When it is determined that the external component video signal source is being connected to the input terminal 1, then the STB key processing subroutine of step #200 is executed.

Accordingly, regardless of the presence or absence of any abnormal connection, the procedure in steps #300 and #700 is executed to appropriately displaying the component video signal Scv on the display 6. The procedure then returns to step S1 to keep on monitoring the connection status between the external component video signal source and the input terminal 1.

As described above, in the component video signal switching device of the present embodiment, the switch 15 as being the connection determination means is provided to the input terminal 1. This is for the purpose of permitting the execution of the STB key processing subroutine of step #200 described in the first embodiment, only when the external component video signal source is being connected to the input terminal 1. Thereafter, the following aspect ratio adjustment subroutine of step #300 and the general television image processing subroutine of step #700 are sequentially executed so that the control for appropriately displaying, on the display 6, the image in accordance with the aspect ratio of the component video signal Scv is performed.

(Fifth Embodiment)

A component video signal switching device according to a fifth embodiment of the present invention is described by referring to FIGS. 15, 16 and 17.

As shown in a block diagram of FIG. 15, a component video signal switching device Vsp5 of the present embodiment has the structure in which the third component video signal switching controller 1000C according to the third embodiment as shown in FIG. 10 is replaced with a fifth component video signal switching controller 1000E. Note that in the fifth component video signal switching controller 1000E, a sync-counter 16 is newly provided in addition to the third component video signal switching controller 1000C. Further, the second controller 11B is replaced by a third controller 11C. The third controller 11C basically has the same structure as that of the second controller 11B except that a reset signal Sr for the sync-counter 16 is outputted therefrom.

The sync-counter 16 counts, based on every vertical synchronization signal V-SYNC inputted from the sync-separator 4, the number of pulses of the horizontal synchronization signal H-SYNC which is also inputted from the sync-separator 4, and outputs the count value Sco to the third controller 11C. The count value Sco in the sync-counter 16 is reset by the reset signal Sr supplied from the third controller 11C.

Based on an internal clock, the third controller 11C counts an interval of the horizontal synchronization signal H-SYNC with

respect to the count value Sco, and determines whether or not the synchronization signal is being inputted properly.

Next, by referring to a flowchart shown in FIG. 16, the major operation of the component video signal switching device Vsp5 is described. In the flowchart of the drawing, the STB key processing subroutine #200 in the flowchart according to the third embodiment as shown in FIG. 12 is replaced by a valid video signal detection/STB key processing subroutine #220.

To be more specific, the component video signal switching device Vsp5 is provided with the sync-counter 16 for determining synchronization based on the first component video signal Scv1 which is inputted through the terminal 1. When the connection is confirmed in step S1, in step #220, it is determined by using the sync-counter 16 whether the first component video signal Scv1 supplied to the input terminal 1 is valid or not.

When receiving a digital code Src for the DTV-STB while the image signal selector 3 is being switched to select the NTSC color-difference signal demodulator 2 side, the third controller 11C analyzes the digital code Src and compares the same with the remote control codes Rc stored in the DTV-STB remote control code table 13 which is internally provided. When any remote control code in the STB remote control code table 13 matches the received digital code Src and also when synchronization of the signal from the component video terminal is detected by sync-detection means and confirmed by the controller, the controller controls the image

signal selector 3 to switch to select the input terminal 1 side, to which the first component video signal Scv 1 (Y, PB, PR) is supplied from the external component video signal source.

Now the operation in the above step #220 is described in detail by referring to a flowchart shown in FIG. 17. In the procedural flow of step #220, later described steps S402, S404, S406, S408, S410, S412, S414, S416, and S418 are inserted in between steps S206 and S208 shown in FIG. 4 which are the detailed steps of step #200.

In detail, after the procedures in steps S202 to S206 as described by referring to FIG. 4, if it is determined that the digital code Src is the code requesting the output of the NTSC color-difference signal demodulator 2 to be selected in the digital image signal selector 3, the procedure advances to step S402.

In step S402, the third controller 11C outputs the reset signal Sr to the sync-counter 16 to reset the count value Sco. The procedure then advances to step S404.

In step S404, the sync-counter 16 monitors the horizontal synchronization signal H-SYNC to be inputted from the sync-separator 4 to determine the presence or absence thereof. If there is no input of the horizontal synchronization signal H-SYNC, "No" is determined and the procedure ends. On the other hand, if there is the input of the horizontal synchronization signal H-SYNC, "Yes" is determined and the procedure advances to

the next step S406.

In step S406, the sync-counter 16 counts up the incoming horizontal synchronization signal H-SYNC based on the master clock. Then the procedure advances to step S408.

In step S408, the sync-counter 16 calculates the horizontal frequency based on the count value obtained in step S406. The sync-counter 16 outputs a count value Sco indicating the calculated value to the third controller 11C. Then the procedure advances to step S410.

In step S410, the third controller 11C determines whether the horizontal frequency calculated in step S408 is correct or not based on the count value Sco received from the sync-counter 16. If not correct, "No" is determined and the procedure ends. If correct, "Yes" is determined and the procedure advances to the next step S412.

In step S412, the sync-counter 16 monitors the vertical synchronization signal V-SYNC to be inputted from the sync-separator 4 to determine the presence or absence thereof. If there is no input of the vertical synchronization signal V-SYNC, "No" is determined and the procedure ends. On the other hand, if the vertical synchronization signal V-SYNC is inputted, "Yes" is determined and the procedure advances to the next step S414.

In step S414, the sync-counter 16 counts up the vertical synchronization signal V-SYNC being inputted from the sync-separator 4 with respect to the horizontal synchronization signal

H-SYNC which is also inputted from the sync-separator 4. Then the procedure advances to step S416.

In step S416, the sync-counter 16 calculates the vertical frequency based on the count value obtained in step S414. The sync-counter 16 outputs a count value Sco indicating the calculated value to the third controller 11C. Then the procedure advances to Step S418.

In step S418, the third controller 11C determines whether the vertical frequency calculated in step S416 is correct or not based on the count value Sco received from the sync-counter 16. If not correct, "No" is determined and the procedure ends. If correct, "Yes" is determined and the procedure advances to the above described step S208.

As described above, in the component video signal switching device Vsp5 of the present embodiment, in addition to the switch 15 for monitoring the connection status between the input terminal 1 and the external component video signal source, the sync-counter 16 as being the sync-detection means for detecting synchronization in the second component video signal Scv2 inputted to the input terminal 1 is provided. Based on the sync-detection result, determination is made whether the first component video signal Scv1 is a valid video signal or not.

Finally, only when the external component video signal source is being connected to the input terminal 1 and when the sync-detection by the sync-counter 16 is confirmed, the execution

of the STB key processing (S208 to S212) is permitted. Thereafter, the following general television image processing subroutine of step #700 is executed so that the control for displaying the image on the display 6 is performed.

(Sixth Embodiment)

A component video signal switching device according to a sixth embodiment of the present invention is described by referring to FIGS. 18 and 19.

As shown in a block diagram of FIG. 18, a component video signal switching device Vsp6 of the present embodiment has the structure in which the fifth component video signal switching controller 1000E in the component video signal switching device Vsp5 as shown in FIG. 15 is replaced with a sixth component video signal switching controller 1000F. Further, in the sixth component video signal switching controller 1000F, the aspect ratio detector 100 described by referring to FIG. 5 is provided in addition to the fifth component video signal switching controller 1000E.

Next, by referring to FIG. 19, the operation of the component video signal switching device Vsp6 is described.

In a flowchart of the drawing, the aspect ratio adjustment subroutine of step #300 according to the second embodiment as shown in FIG. 6 is inserted in between steps #220 and #700 in the flowchart according to the fifth embodiment as shown in FIG. 16.

As a result, in the component video signal switching device according to the present embodiment, the connection status between the input terminal 1 and the external component video signal source is monitored and further, the sync-detection of the second component video signal Scv2 inputted to the input terminal 1 is performed. Finally, only when the external component video signal source is being connected to the input terminal 1 and when the sync-detection by the sync-counter 16 is confirmed, the execution of the STB key processing (S208 to S212) is permitted.

Note that herein, regardless of the presence or absence of the STB key processing, the aspect ratio of the display 6 is adjusted in accordance with the component video signal Scv through the aspect ratio adjustment processing of step #300. Thereafter, the following general television image processing subroutine of step #700 is executed so that the control for displaying the image on the display 6 is performed.

(Seventh Embodiment)

Next, a component video signal switching device according to a seventh embodiment of the present invention is described by referring to FIGS. 20, 21, 22, and 23.

As shown in a block diagram of FIG. 20, a component video signal switching device Vsp7 of the present embodiment has the structure in which the sixth component video signal switching controller 1000F according to the sixth embodiment as shown in

FIG. 18 is replaced with a seventh component video signal switching controller 1000G.

In the seventh component video signal switching controller 1000G, an on-screen-message generator (indicated as "OSMG" in the drawing) 17 and an automatic setting register 18 are newly provided in addition to the sixth component video signal switching controller 1000F. The on-screen-message generator 17 gives a user the option on the display 6 as the on-screen-message exemplarily shown in FIG. 23 of: making the image signal selector 3 to automatically select the output from the input terminal 1 whenever the component video signal switching device Vsp7 detects a remote control code for the DTV-STB; or instructing a user-selection on each occasion. The user responds to the message on the display 6 by the remote-controller to set a desired option.

The automatic setting register 18 stores the details of the option set by the user in response to the on-screen message given by the above stated on-screen-message generator 17 on the display 6.

By referring to FIG. 23, a method for automatically setting the selection of the input source for the selector 3 in correspondence with the above on-screen-message is described. On the screen of the display 6, an automatic setting menu is exemplarily displayed as shown in FIG. 23. In the automatic setting menu, "AUTOMATIC SETTING", " YES", and "NO" are displayed. As described above, "AUTOMATIC SETTING" means to make the image

signal selector 3 to automatically select the output from the input terminal 1 when the component video signal switching device Vsp7 detects any DTV-STB remote control code. "YES" and "NO" means to make "AUTOMATIC SETTING" valid and invalid, respectively.

The user selects either "YES" or "NO" by the remote controller. The selected option is stored in the automatic setting register 18.

Note that, if "YES" is selected, as is the case when the STB key processing is permitted in the component video signal switching devices Vsp1 to Vsp6 according to the first to sixth embodiments, the image signal selector 3 is automatically set to select the output from the input terminal 1 when a DTV-STB remote control code is detected. On the other hand, for a user who is not accustomed to the automatic setting function, it is also an effective way to select "NO" to avoid confusion.

The above described operation is now described by referring to flowcharts shown in FIGS. 21 and 22. Firstly, by referring to FIG. 21, the major operation of the component video signal switching device Vsp7 is described. In the flowchart of FIG. 21, an input source automatic switching setting subroutine of #500 is provided in between the initialization subroutine of step #100 and step S1 in the flowchart according to the third embodiment as shown in FIG. 12.

As described by referring to FIG. 12, when the operation

of the component video signal switching device is started, the initialization takes place first in step #100. Then, before determining whether or not the input terminal 1 and the external component video signal source is being connected with the cables in step S1, in step S502 shown in FIG. 22 as the detailed step of step #500, the user's intention whether or not to perform the input source automatic switching setting is confirmed.

As a method for the user's intention confirmation in step S502, the user may convey the intention to the component video signal switching device Vsp during a predetermined time interval after the initialization in step #100 with input means such as a remote-controller. Alternatively, the third controller 11C may drive the on-screen-message generator 17 after the initialization in step #100 to display a message on the display 6 to confirm the user's intention.

If confirmed "Yes" in step S502, that is, if the user has the desire for the input source automatic switching setting, the procedure advances to the next step S504.

In step S504, the on-screen-message shown in FIG. 23 (abbreviated as "OSM") is displayed, and then the procedure advances to the next step S506.

In step S506, the user selects, in accordance with the on-screen message, "YES" or "NO" for the automatic setting by the remote controller. The procedure then advances to the next step S508.

In step S508, the setting of the selection made in step S506 is stored in the automatic setting register 18. The procedure then advances to the next step S510.

In step S510, the setting of the selection stored in step S508 is read from the automatic setting register 18. Then the procedure advances to the next step S1.

On the other hand, if confirmed "No" in step S502, that is, if the user has no desire for the input source automatic switching setting, the procedure skips the above steps S504, S506, and S508 and advances to step S510.

As described above, in the present embodiment, the confirmation is made of the user's intention whether or not to perform the input source automatic switching setting at the stage where the component video signal switching device Vsp7 is turned on and started its operation. When the user has the intention for the setting, whether or not to start the automatic setting is selected and registered by the method described by referring to FIG. 23. The image signal selector 3 performs the automatic input source selection as described in the above until the component video signal switching device Vsp7 is turned off.

Note that, in the present embodiment, although the input source automatic switching setting subroutine is inserted in between step #100 and step S1 as step #500, it may be incorporated in the general television image processing subroutine of step #700, thereby enabling the execution of the input source automatic

switching setting as many as an arbitrary number of times during the operation of the component video signal switching device Vsp7, while it is limited to once which is immediately after the power turned on in the present embodiment.

(Eighth Embodiment)

A component video signal switching device according to an eighth embodiment of the present invention is described by referring to FIGS. 24, 25, 26, and 27.

As shown in a block diagram of FIG. 24, a component video signal switching device Vsp8 of the present embodiment has the structure in which the seventh component video signal switching controller 1000G in the component video signal switching device Vsp7 according to the seventh embodiment as shown in FIG. 20 is replaced with an eighth component video signal switching controller 1000H. In the eighth component video signal switching controller 1000H, a message register 19 is provided in addition to the seventh component video signal switching controller 1000G. The message register 19 stores the description of a warning message for display. For example, when the cables for the luminance signal Y and the color-difference signals PB and PR are not connected to the input terminal 1, the third controller 11C recognizes the fact based on the switch signal Ssw outputted from the switch 15.

The third controller 11C then reads message data Smsg

indicating a message 1 which corresponds to the recognized fact from the message register 19. Further, the third controller 11C writes the description of the read message data Smsg into the on-screen-message generator 17. Accordingly, a first warning message exemplarily shown in FIG. 26 is displayed on the display 6.

For another example, when the switch 15 detects the valid connection of the external component video signal source to the input terminal 1 but the sync-counter 16 confirms no synchronization signal from the DTV-STB, the third controller 11C recognizes that the external STB as being the external component video signal source is not turned on, or recognizes that the first component video signal Scv1 being inputted to the input terminal 1 is not valid.

Thereafter, the third controller 11C reads message data Smsg indicating a message 2 which corresponds to the recognized fact from the message register 19. Further, the third controller 11C writes the message data Smsg into the on-screen-message generator 17 to display a second warning message as exemplarily shown in FIG. 27 on the display 6.

The operation of the component video signal switching device Vsp8 in the present embodiment is described by referring to a flowchart of the above described operation as shown in FIG. 25.

In the flowchart shown in FIG. 25, a first warning message

display subroutine #600 is provided in between steps S1 and S3 in the flowchart according to the seventh embodiment as shown in FIG. 21, and a second warning message display subroutine #650 is provided in between steps S1 and #200.

In detail, in step S1, the third controller 11C determines that the external cables are not properly connected to the input terminal 1 based on the switch signal Ssw supplied from the switch 15. Then the procedure advances to step S602 which is the detailed step of the first warning message display subroutine #600.

In step S602, the third controller 11C reads the message data Smsg indicating the message 1 from the message register 19. Then the procedure advances to the next step S604.

In step S604, the third controller 11C writes the message data Smsg read from the message register 19 into the on-screen-message generator 17. The procedure then advances to the next step S606.

In step S606, the on-screen-message generator 17 generates and outputs to the display 6, the on-screen-message representing the message data Smsg written therein by the third controller 11C. As a result, the display 6 displays the first warning message as shown in FIG. 26. The procedure then advances to the next step S3 and further to step #700.

On the other hand, if determined "Yes" in step S1, that is if it is determined that the external cables are properly connected to the input terminal 1, the procedure advances to step

S652 which is the detailed step of the second warning message display subroutine #650.

In step S652, the third controller 11C determines whether or not the first component video signal Scv1 is valid based on the count value Sco. If determined invalid, the procedure advances to the next step S654.

In step S654, the third controller 11C reads the message data Smsg indicating the message 2 from the message register 19. Then the procedure advances to the next step S656.

In step S656, the third controller 11C writes the message data Smsg read from the message register 19 into the on-screen-message generator 17. The procedure then advances to the next step S658.

In step S658, the on-screen-message generator 17 generates and outputs to the display 6, the on-screen-message representing the message data Smsg written therein by the third controller 11C. As a result, the display 6 displays the second warning message as shown in FIG. 27. To be specific, the user is notified by the display that the external cables are connected to the input terminal 1 but a valid first component video signal Scv1 is not supplied. The procedure then advances to the next step #200 and further to step #700.

On the other hand, if it is determined that the first component signal Scv1 is valid in step S652, the procedure skips the above described steps S654, S656, and S658 and advances to

the STB key processing subroutine of #200.

By referring to the accompanied drawings of FIG. 1 to FIG. 27, the component video signal switching devices according to the various embodiments of the present invention are described. Yet, an exemplary modification as described below may be possible for the component video signal switching device Vsp. In such modification, a standby power supply is provided to continuously drive the remote control wave receiver 12 and the controller 11 in the component video signal switching controller 1000 of the component video signal switching device Vsp. While the main power to the the component video signal switching device Vsp being turned off, only the controller 11 and the remote control wave receiver 12 are being driven by the standby power supply to monitor remote control instructions from an user.

Thereafter, if a remote control wave from the user is determined as a code for the external component video signal source (externally connected equipment) in the matching code detection step S202 in the STB key processing subroutine #200, the main power is immediately supplied to the component video signal switching device Vsp including the component video signal switching controller 1000 to display the image of an user-desired component signal Scv by selectively switching the signal. In such manner, the power consumed in the component video signal switching device Vsp is not wasted.

As described in the foregoing, according to the present

invention, by providing the code table for the remote controller dedicated to the DTV-STB and the determination means in the television receiver, on-off control of the power supply to the television set, or signal switching by selecting the component video signal input terminal becomes possible in link with the operation of the DTV-STB remote controller, thereby providing usability as if the DTV-STB is installed in the television receiver. Therefore, the outstanding effect of providing an easy-of-use television receiver even in an upcoming DTV age can be obtained. Further, by providing the functions of connection determination and sync-detection, such a beneficial effect can be achieved that user's usability is extremely improved. All together, the present invention can play an effective role in making DTV more widely available by providing the easy method of access thereto.

Note that in the above described embodiments the case where the first component video signal Scv1 is switched to the second component video signal Scv2 is described. It is obvious, however that the switching from the second component video signal Scv2 to the first component video signal Scv1 is done in the similar way.

INDUSTRIAL APPLICABILITY

As described above, the present invention can be applied to image display, typically on a television to which a plurality

of types of component video signals are inputted from an external device such as an STB for digital television and DVD player.

WHAT IS CLAIMED IS:

1. A component video signal switching device for selectively switching, based on a command linked with an externally provided first signal source and an internally provided second signal source and transmitted from a single remote controller, between a first component video signal inputted from first input means which is connected to said first signal source and a second component video signal inputted from said second signal source for displaying an image on a display, comprising:

component video signal selection means for selectively outputting said first and second component video signals to said display;

command reception means for receiving said command; and

control means for controlling said selection means to select one of said first and second component video signals that is having a link with said received command, wherein

the component video signal is switched by the minimum number of commands.

2. The component video signal switching device as claimed in claim 1, wherein

said control means includes aspect ratio detection means for detecting an aspect ratio of the image carried on said selected component video signal, and

adjusts any one of vertical and horizontal deflection angles of said display based on said detected aspect ratio to display the image properly.

3. The component video signal switching device as claimed in claim 1, wherein

said control means includes connection determination means for determining a connection status between said first input means and said first component video signal source, and

when determined by said connection determination means that the connection status is non-connection, said control means controls said selection means to select said second component video signal.

4. The component video signal switching device as claimed in claim 1, wherein

said control means includes aspect ratio detection means for detecting an aspect ratio of the image carried on said selected component video signal,

when said connection determination means detects that the connection status is non-connection, said control means controls said selection means to select said second component video signal, and adjusts any one of vertical and horizontal deflection angles of said display to display the image properly.

5. The component video signal switching device as claimed in claim 1, wherein

said control means includes component video signal determination means for determining validity of said first component video signal based on a horizontal synchronization signal and a vertical synchronization signal included in the first component video signal, and

when said component video signal determination means determines the signal as being invalid, said control means controls said selection means to select said second component video signal.

6. The component video signal switching device as claimed in claim 5, wherein

said control means further includes aspect ratio detection means for detecting an aspect ratio of the image carried on said selected component video signal, and

when said component video signal determination means determines the signal as being invalid, said control means controls said selection means to select said second component video signal, and adjusts any one of vertical and horizontal deflection angles of said display based on said detected aspect ratio to display the image properly.

7. The component video signal switching device as

claimed in claim 3, wherein

said control means includes component video signal determination means for determining validity of said first component video signal based on a horizontal synchronization signal and a vertical synchronization signal included in the first component video signal, and

when said component video signal determination means determines the signal as being invalid, said control means controls said selection means to select said second component video signal even if said connection determination means detects a connection.

8. The component video signal switching device as claimed in claim 7, wherein

said control means further includes aspect ratio detection means for detecting an aspect ratio of the image carried on said selected component video signal, and

when said component video signal determination means determines the signal as being invalid, said control means controls said selection means to select said second component video signal even if said connection determination means detects a connection, and adjusts any one of vertical and horizontal deflection angles of said display based on said detected aspect ratio to display the image properly.

9. The component video signal switching device as claimed in claim 1, wherein

said control means includes selection restriction means for restricting control on said selection means based on said received command.

10. The component video signal switching device as claimed in claim 3, wherein

said control means includes first message display means for outputting a first message corresponding to the result of the connection status determination by said connection determination means.

11. The component video signal switching device as claimed in claim 7, wherein

said control means includes second message display means for outputting a second message corresponding to the result of the connection status determination by said connection determination means.

12. The component video signal switching device as claimed in claim 1, further comprising:

first power supply means for driving said control means and said command reception means, and

second power supply means for driving the component video

signal switching device entirely at the time when said control means controls said selection means to select any one of the component video signals, wherein

power consumption is reduced in a case where switching between the component video signal is not required.

13. The component video signal switching device as claimed in claim 1, wherein

said first signal source is a set-top box and said second signal source is an NTSC broadcast wave.

14. The component video signal switching device as claimed in claim 1, wherein

said remote controller stores the commands linked with said first and second component video signals.

15. A display for displaying a signal image, wherein the component video signal switching device as claimed in claim 1 is incorporated.

16. A component video signal switching method for selectively switching, based on a command linked with an externally provided first signal source and an internally provided second signal source and transmitted from a single remote controller, between a first component video signal inputted from

first input means which is connected to said first signal source and a second component video signal inputted from said second signal source for displaying an image on a display, comprising:

a command reception step of receiving said command;

a link determination step of determining with which of said first and second component video signals said received command has a link; and

a selection step of selecting one of said first and second component video signals that is determined to have a link in said link determination step.

ABSTRACT OF THE DISCLOSURE

In a component video signal switching device (Vsp) for selectively switching, based on a command (Src, Rc) linked with an externally provided first signal source (STB) and an internally provided second signal source (NTSC, 2), between a first component video signal (Scv1) inputted from a input terminal (1) which is connected to the first signal source (STB) and a second component video signal (Scv2) inputted from the second signal source (NTSC, 2) transmitted from a single remote controller, and displaying an image on a display device (6), a remote control wave receiver (12) receives the commands (Src, Rc). An image signal selector (3) selectively outputs any one of the first and second component video signals (Scv1, Scv2) to the display device 6. A component video signal switching controller (1000A) controls the image signal selector to select, out of the first and second component video signals (Scv1, Scv2), the signal having a link with the received command (Src, Rc).

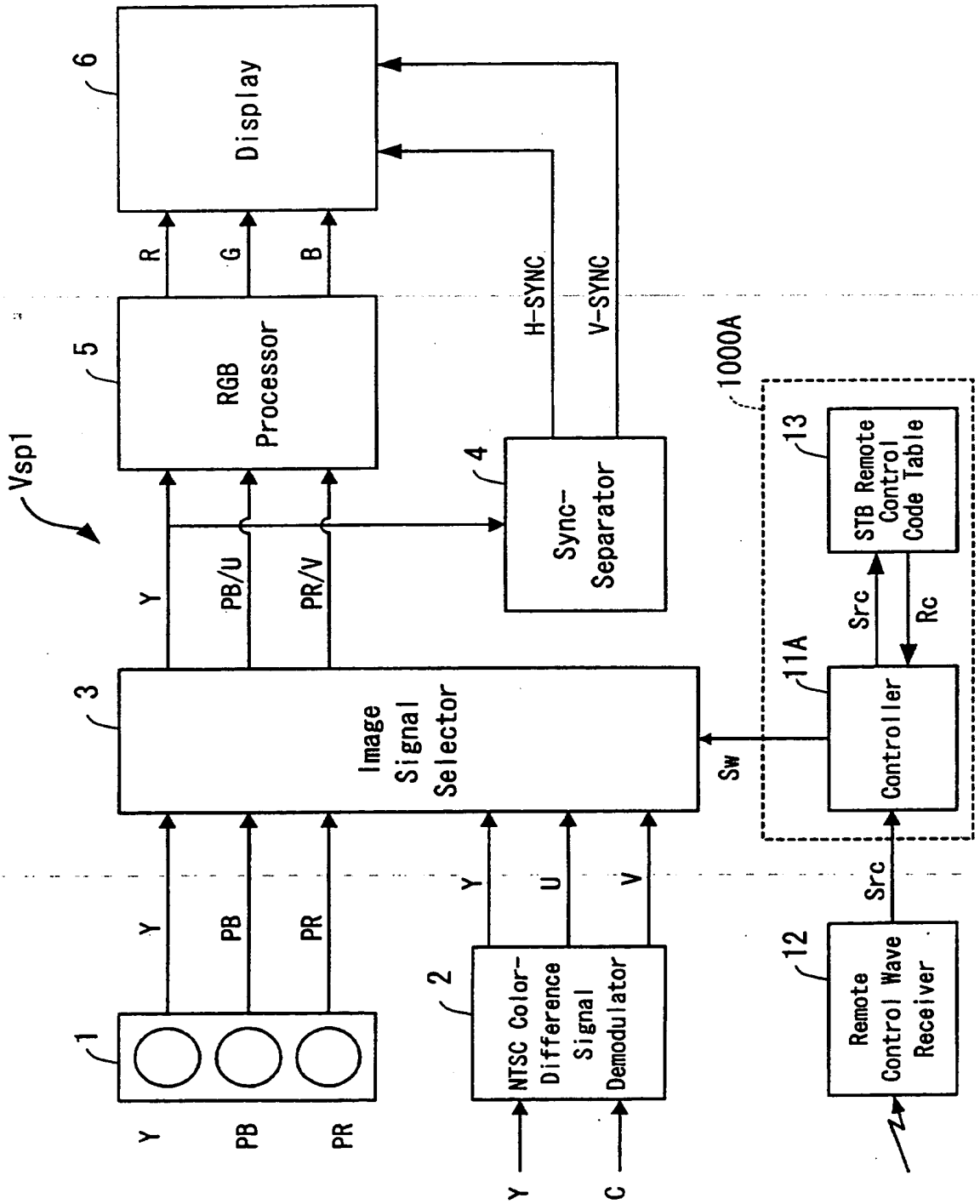


Fig. 1

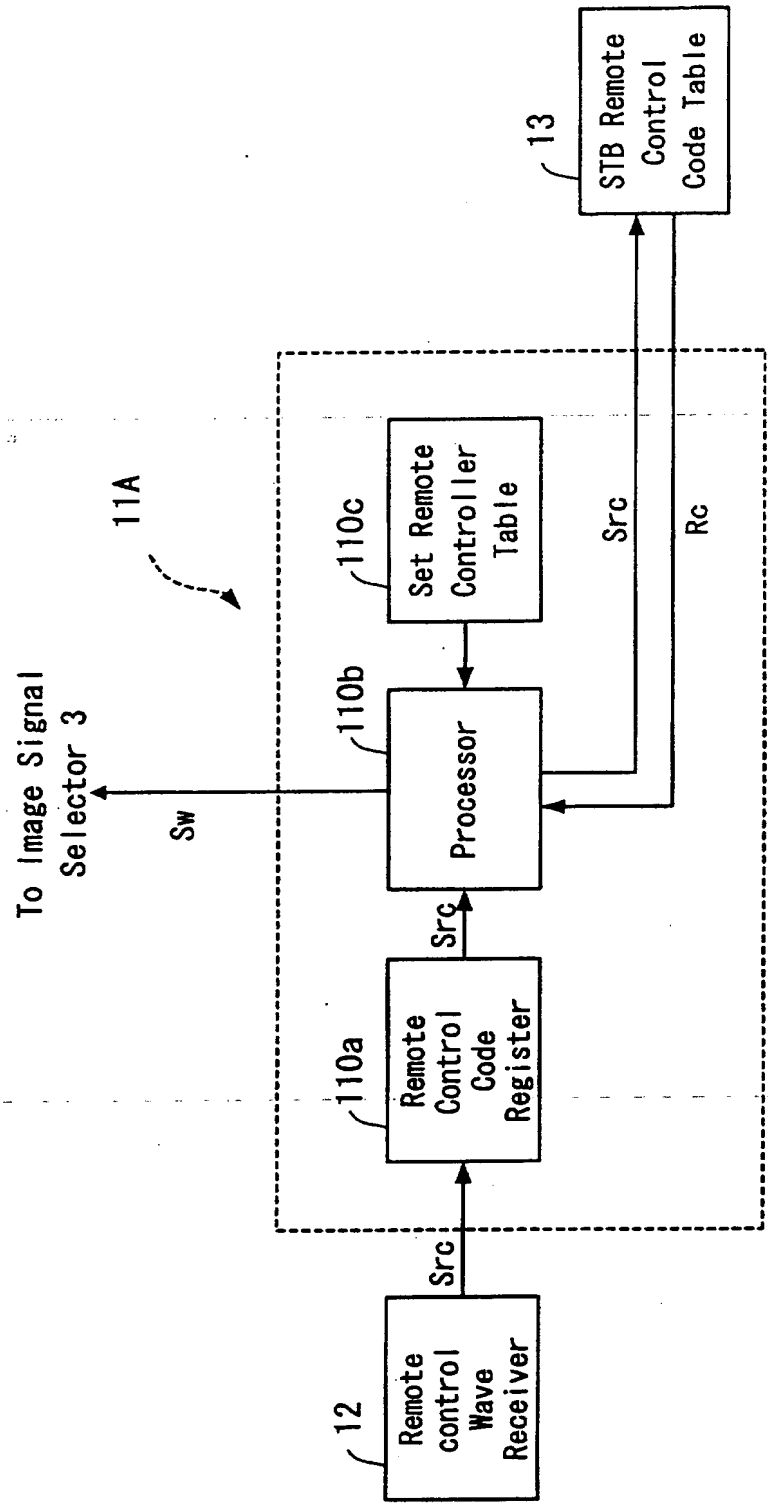


Fig. 2

Fig. 3

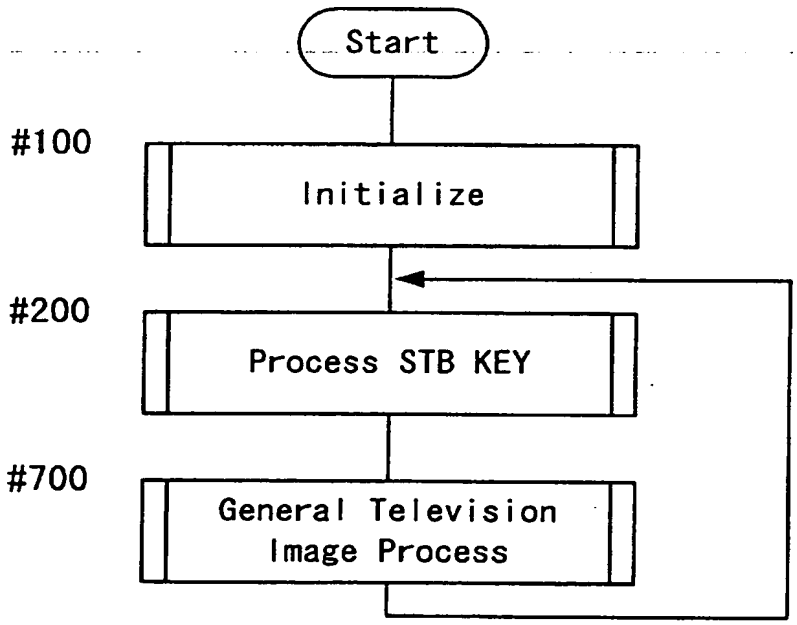
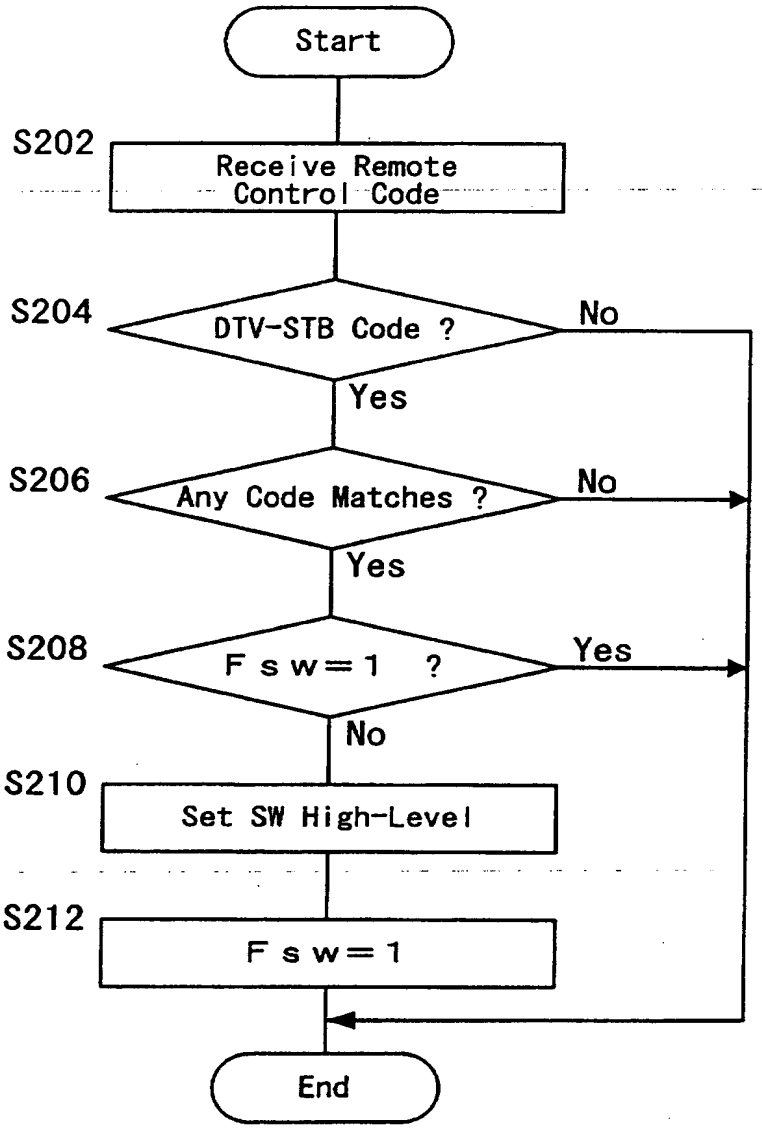


Fig. 4



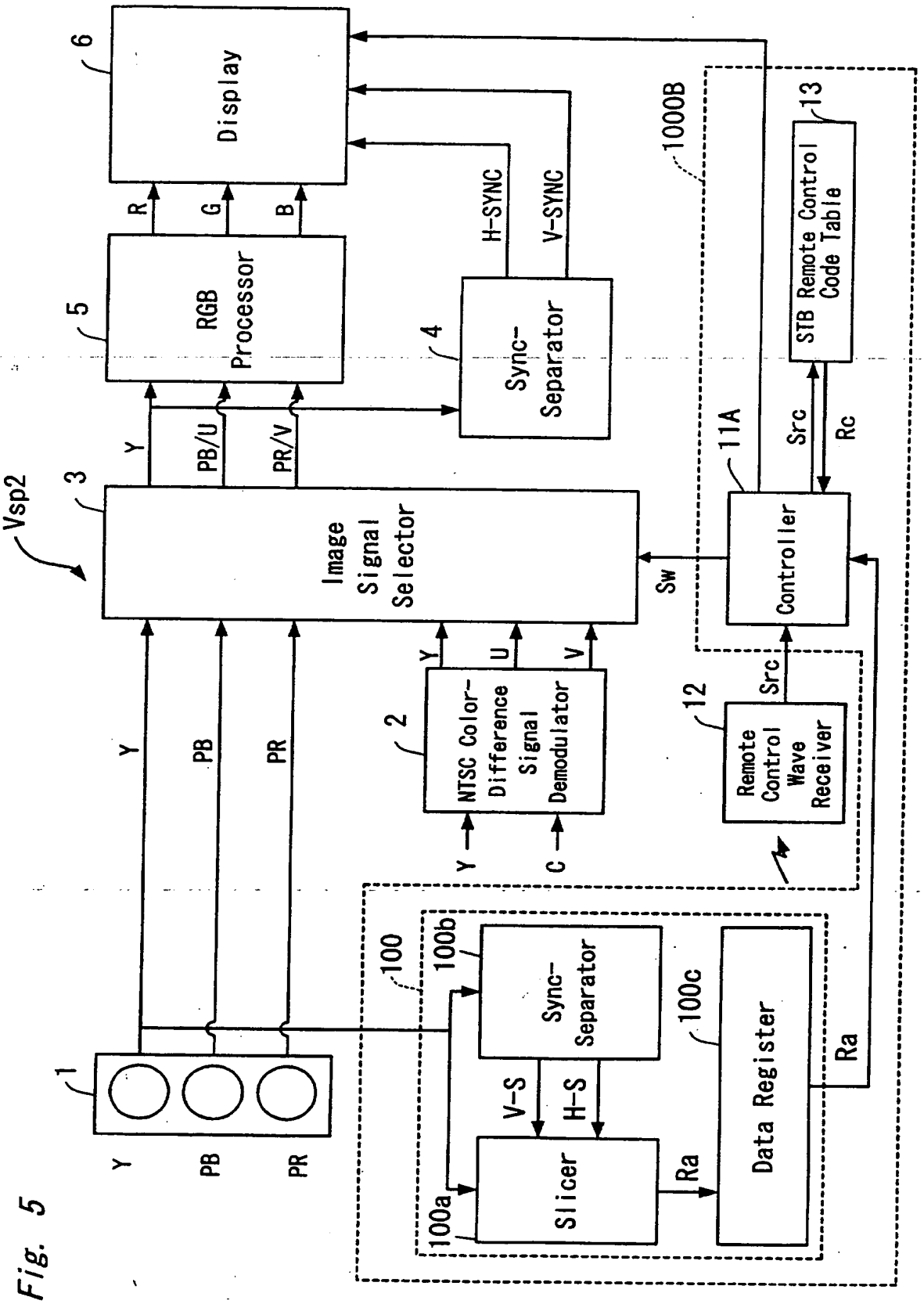
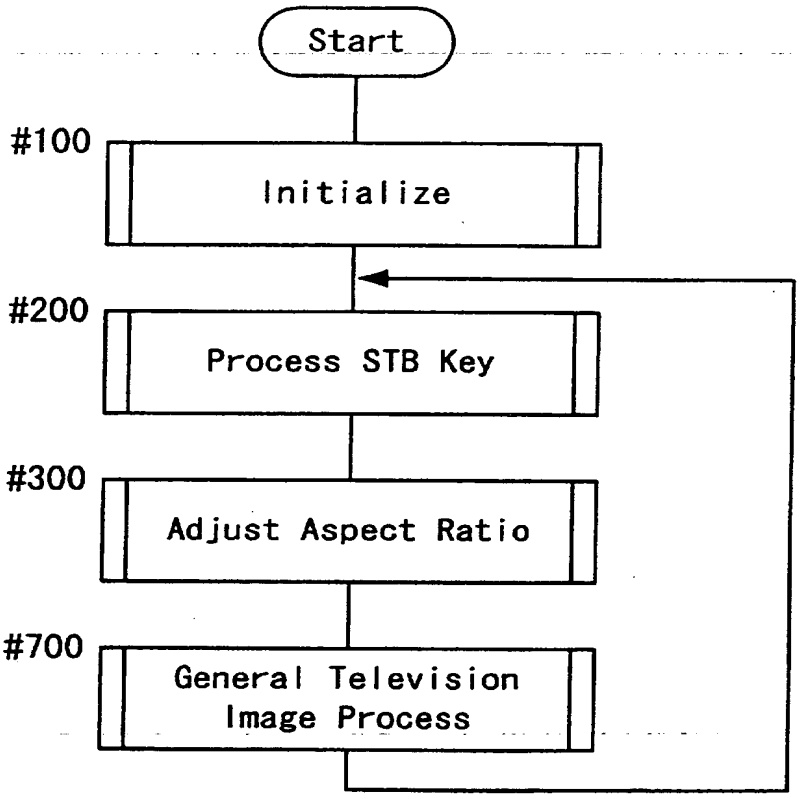


Fig. 5

Fig. 6



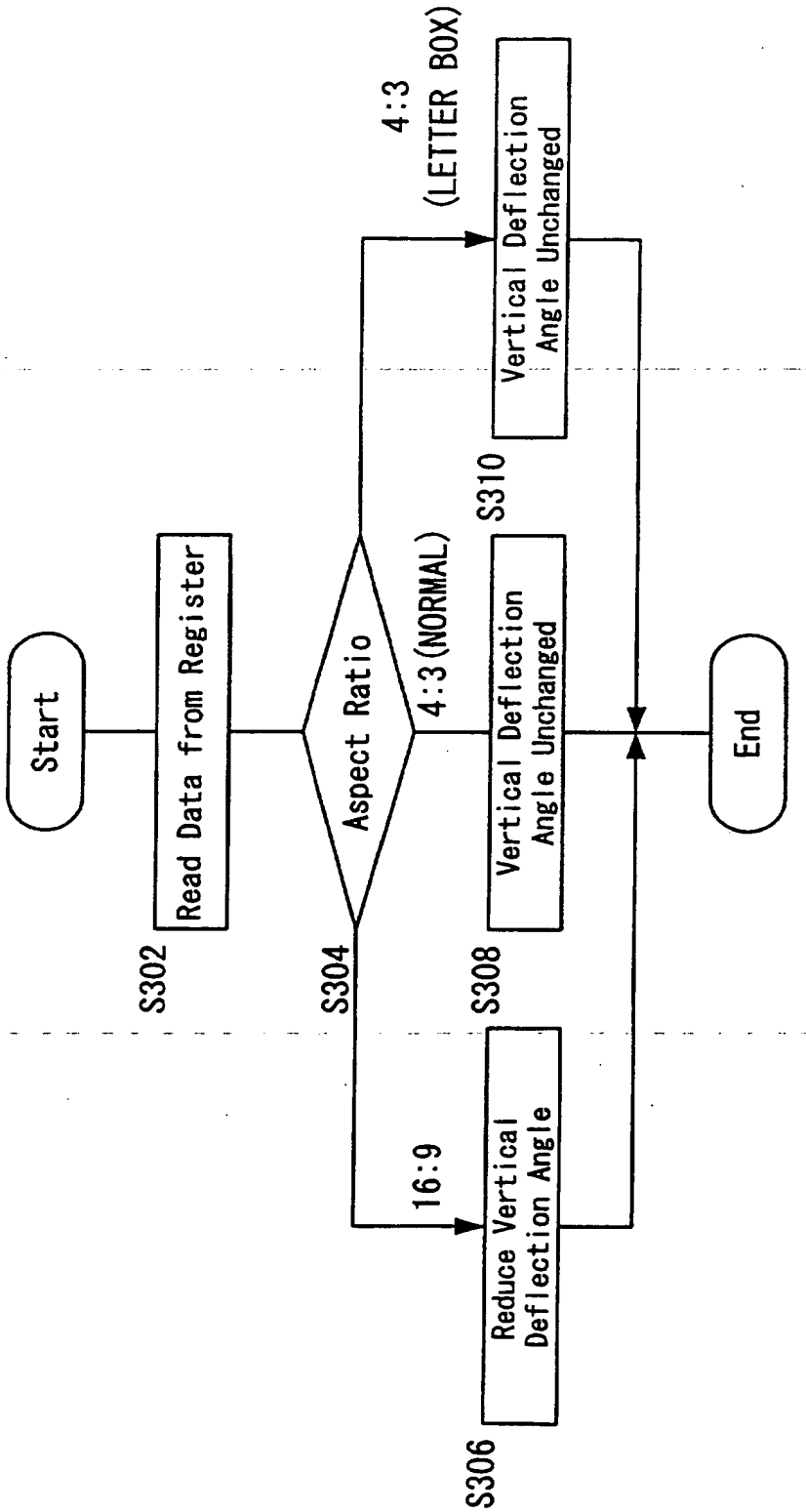


Fig. 7

Fig. 8

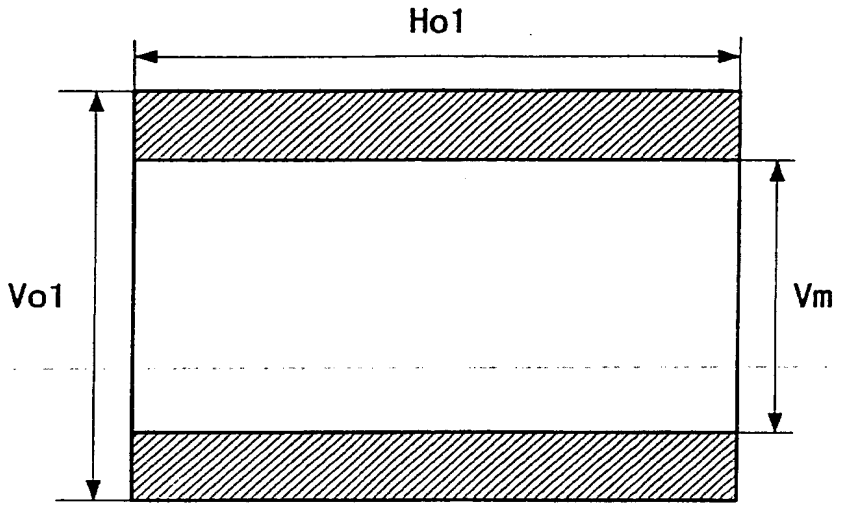
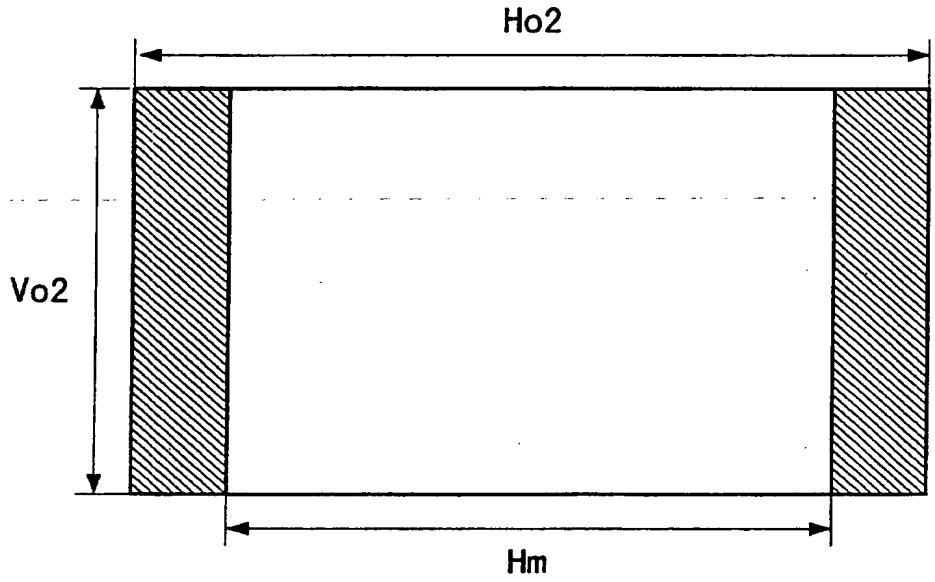


Fig. 9



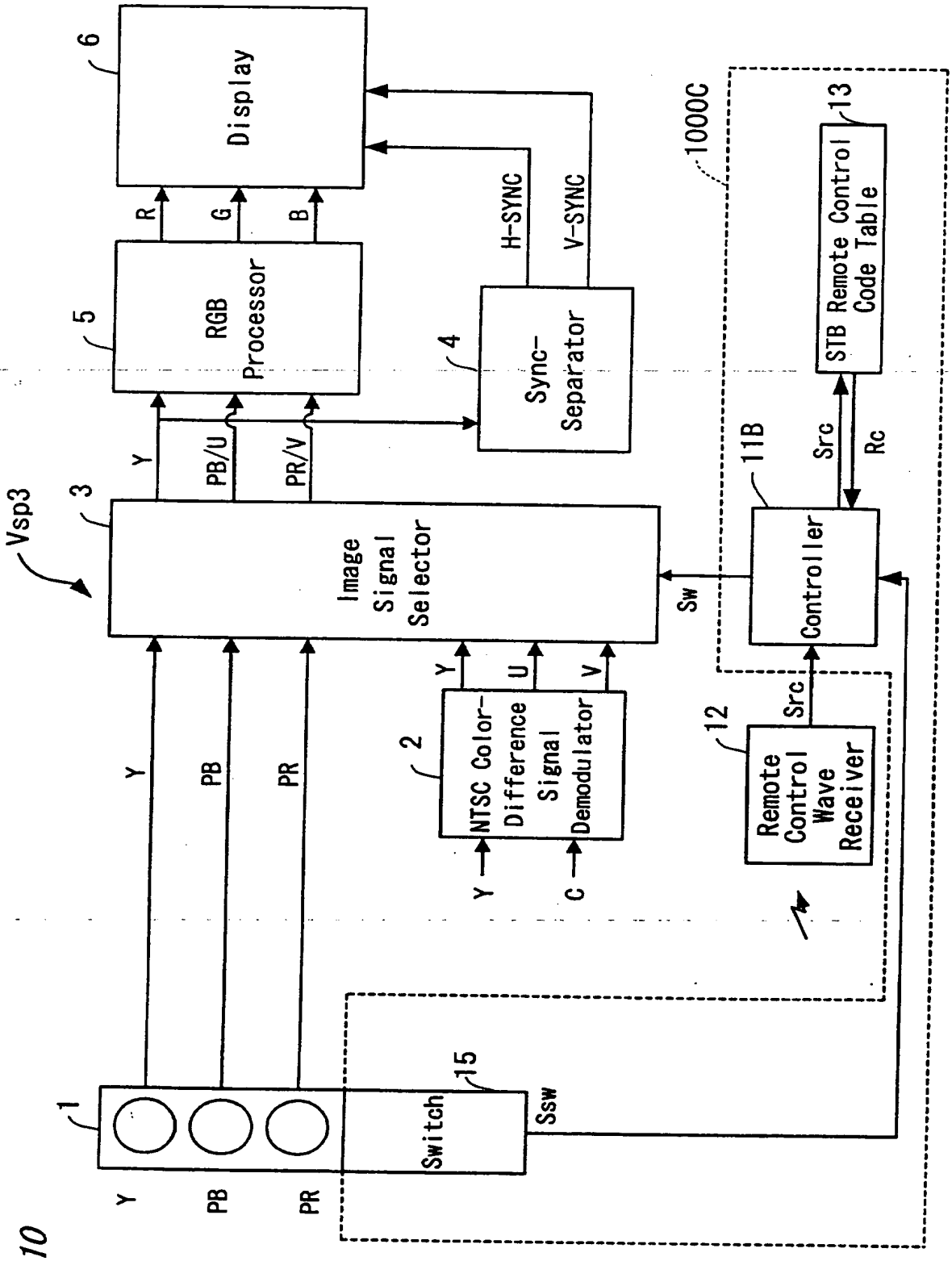


Fig. 10

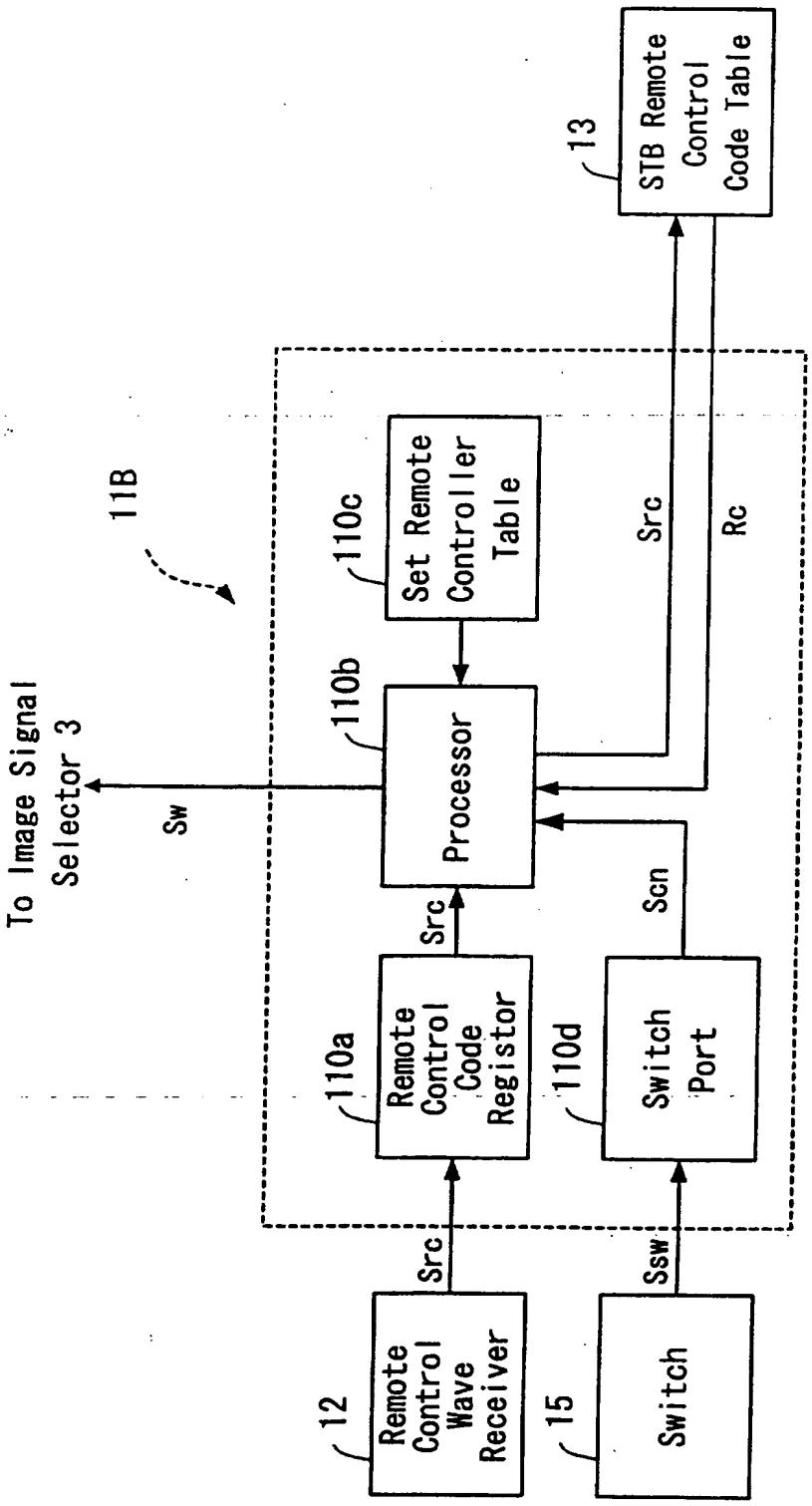
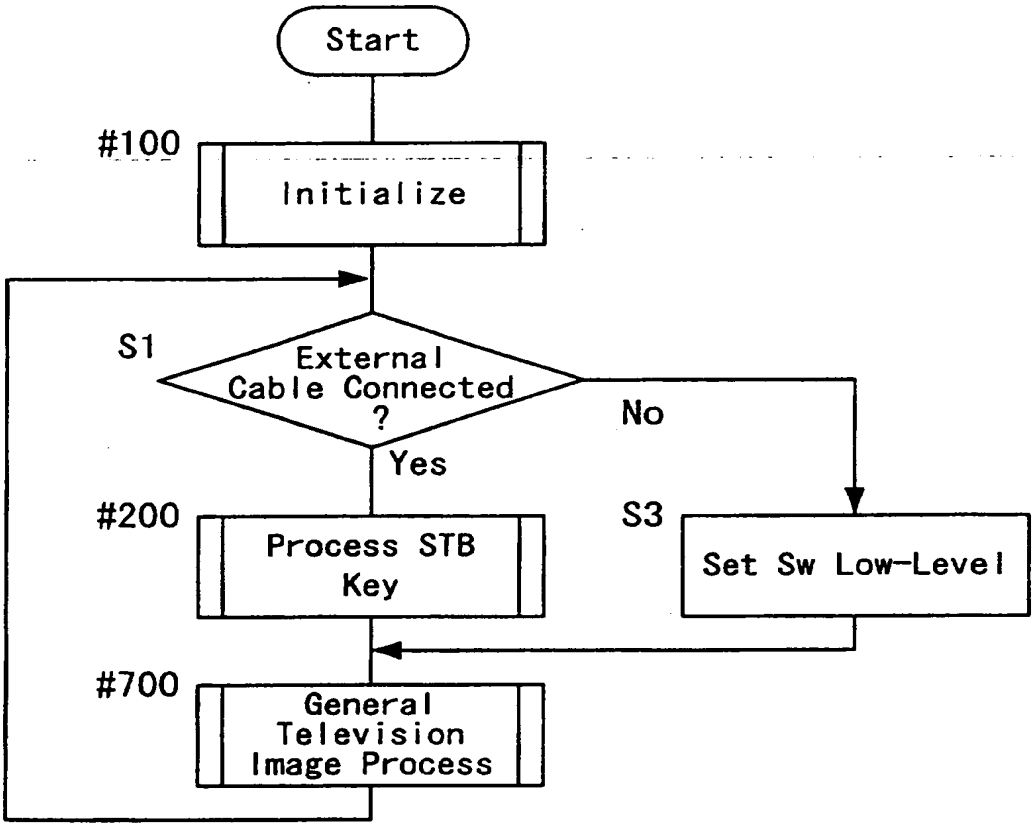


Fig. 11

Fig. 12


Start
#100
Initialize
S1
External Cable Connected ?
No
Yes
#200
Process STB Key
S3
Set Sw Low-Level
#700
General Television Image Process

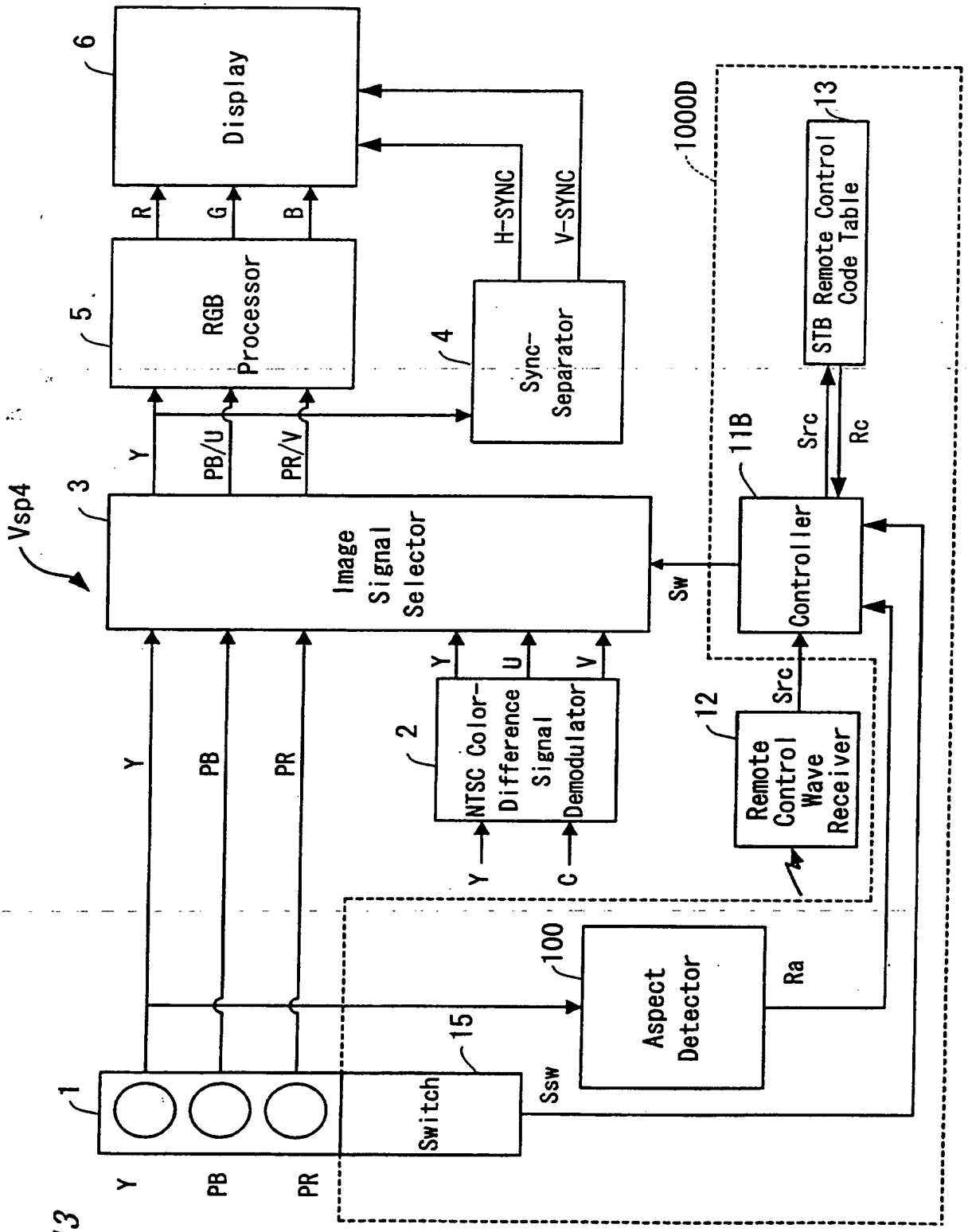
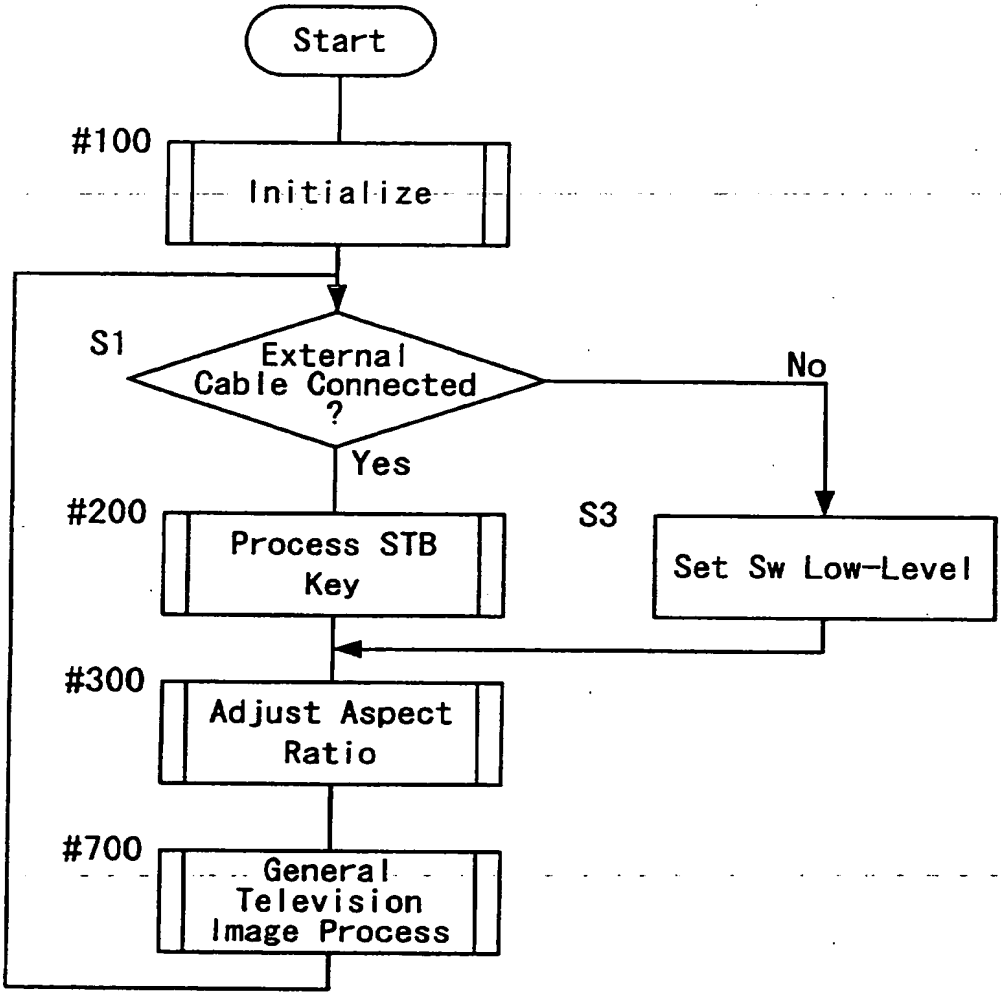


Fig. 13

Fig. 14



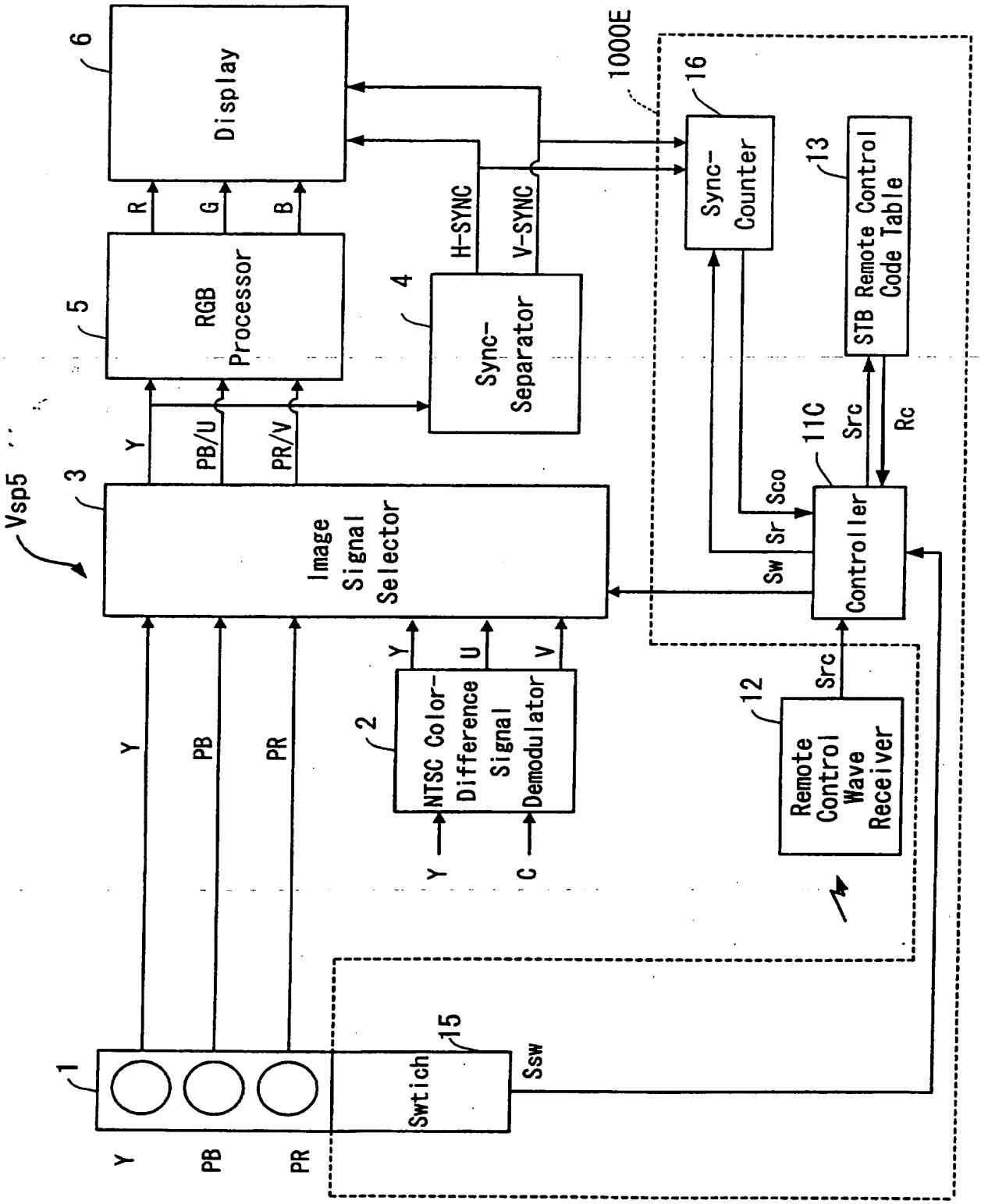


Fig. 15

Fig. 16

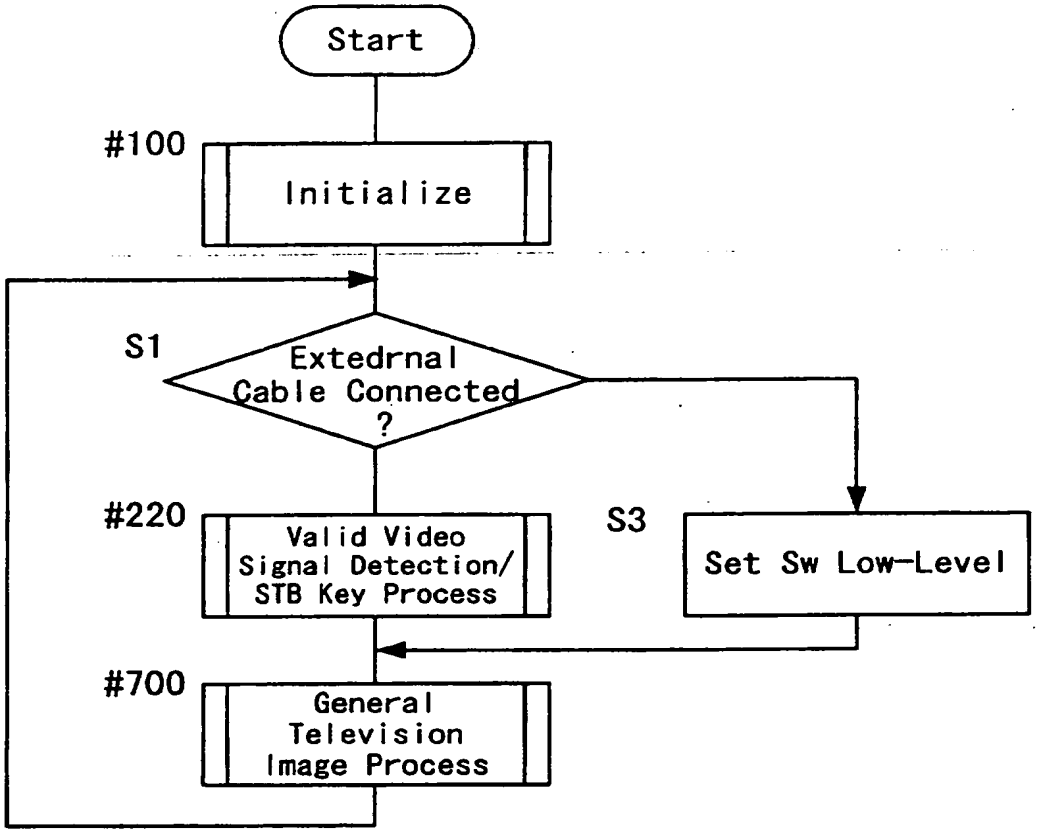
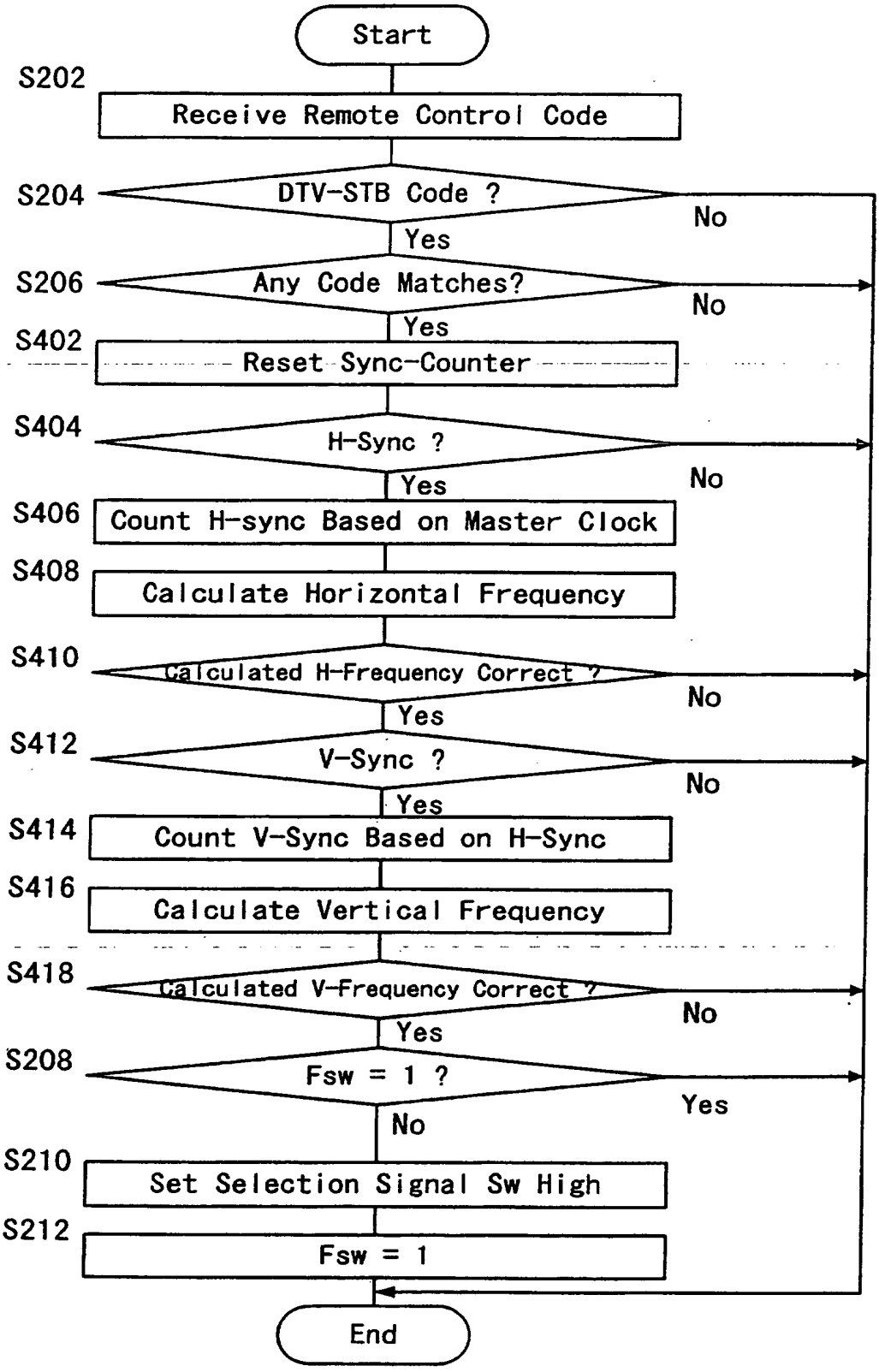

Start
#100
Initialize
S1
Extedrnal Cable Connected ?
#220
Valid Video Signal Detection/ STB Key Process
S3
Set Sw Low-Level
#700
General Television Image Process

Fig. 17



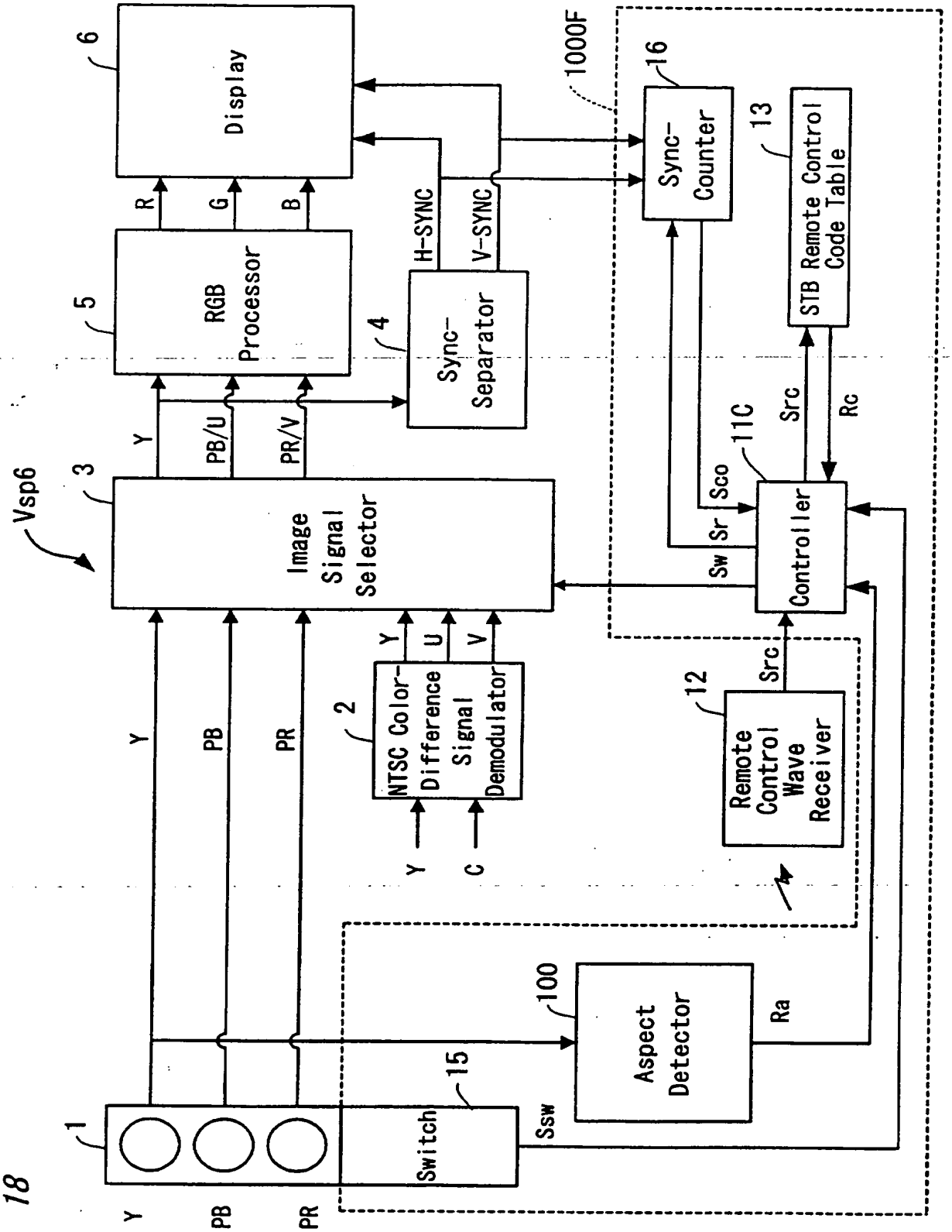
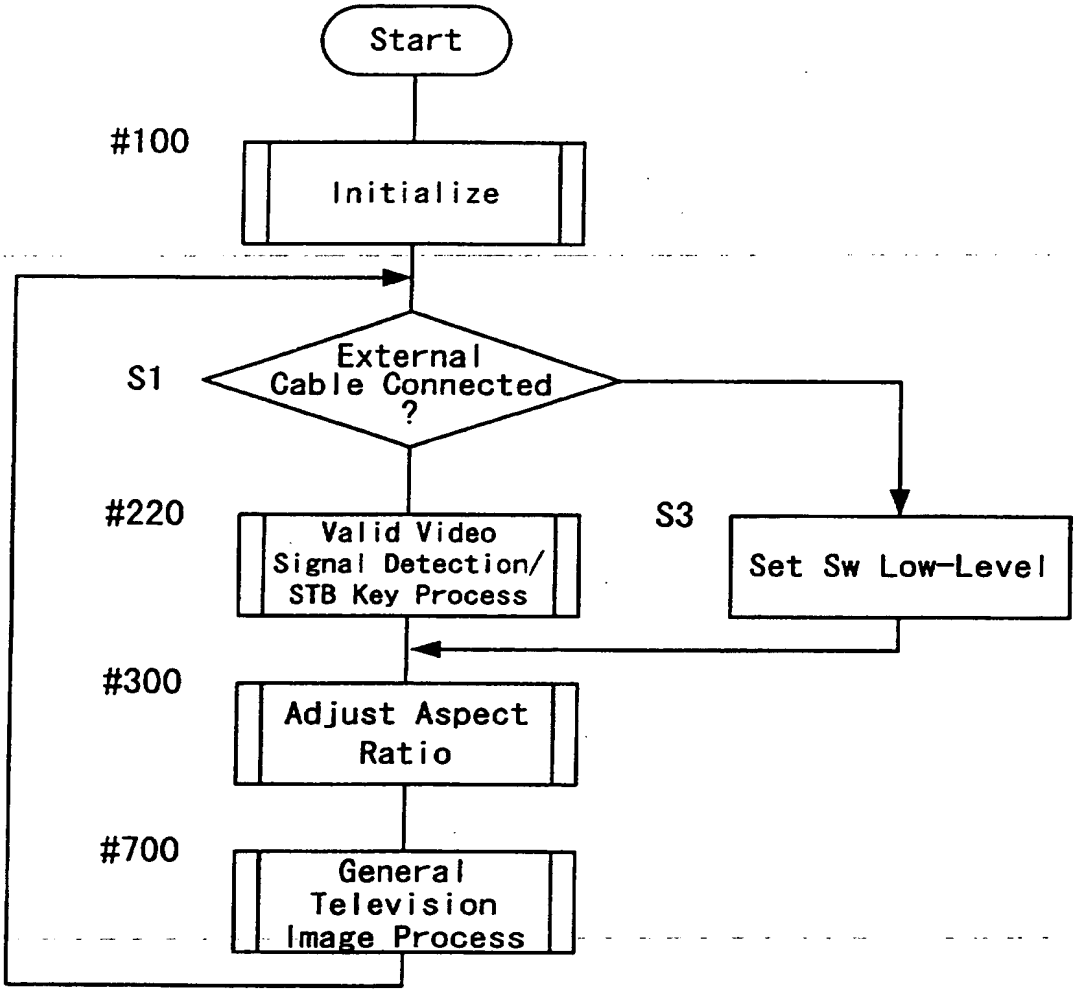

Display
6
1000F
16
Sync-
Counter
13
STB Remote Control
Code Table
R
G
B
H-SYNC
V-SYNC
RGB
Processor
5
Sync-
Separator
4
Y
PB/U
PR/V
Vsp6
3
Image
Signal
Selector
Src
Rc
11C
Sco
Sr
Sw
Controller
Y
U
V
NTSC Color-
Difference
Signal
Demodulator
2
Src
12
Remote
Control
Wave
Receiver
Y
C
Y
PB
PR
100
Aspect
Detector
Ra
15
Switch
Ssw
1
Y
PB
PR

Fig. 18

Fig. 19



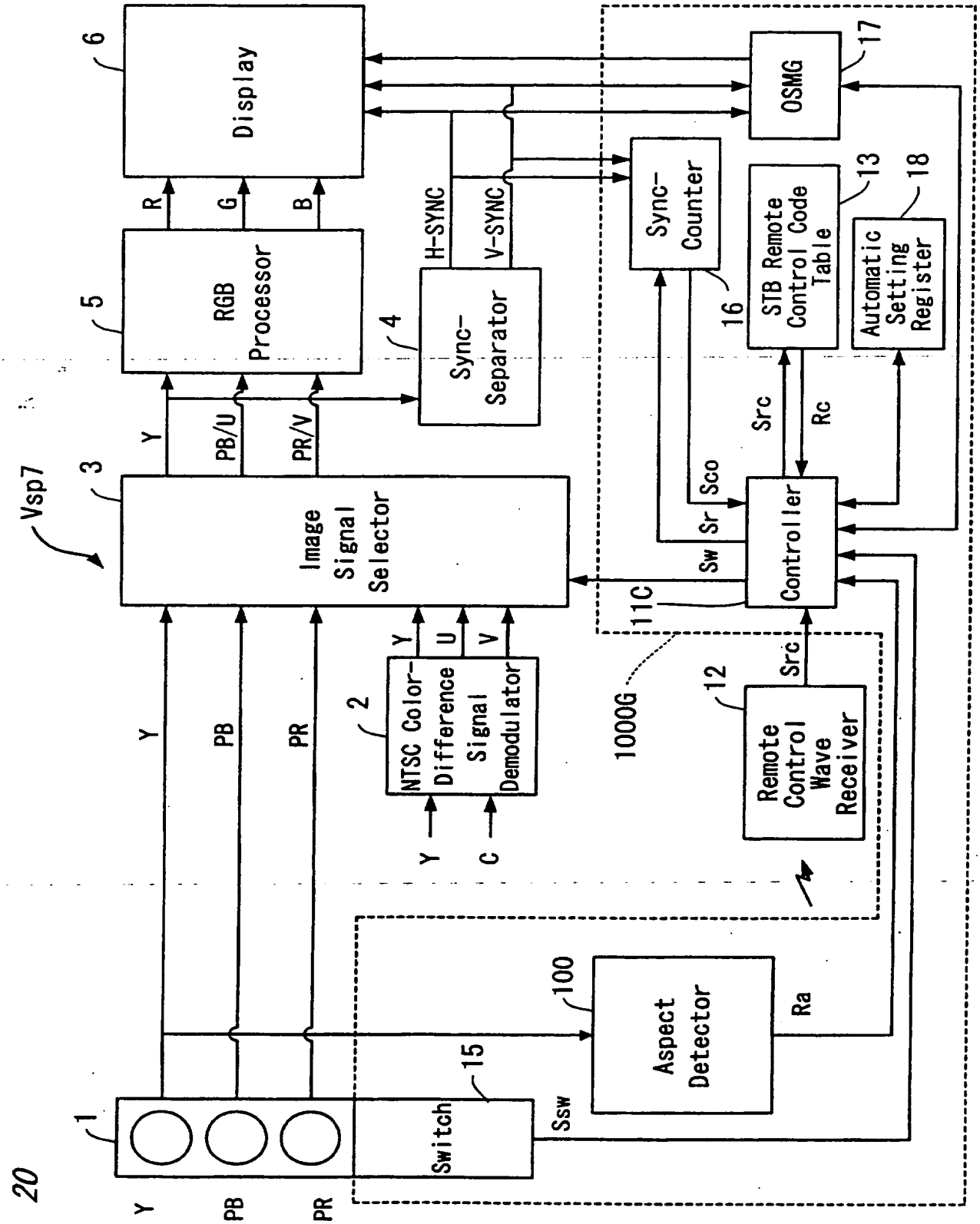


Fig. 20

Fig. 21

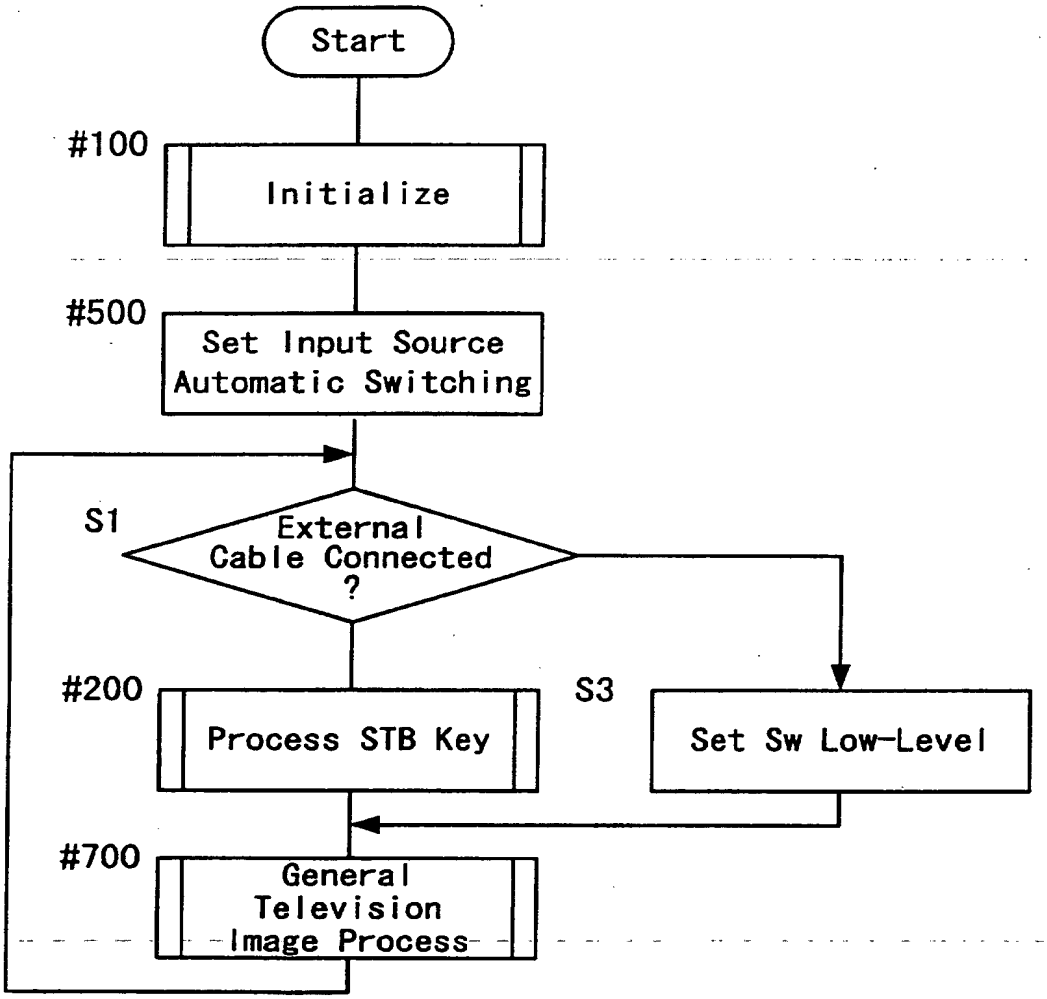


Fig. 22

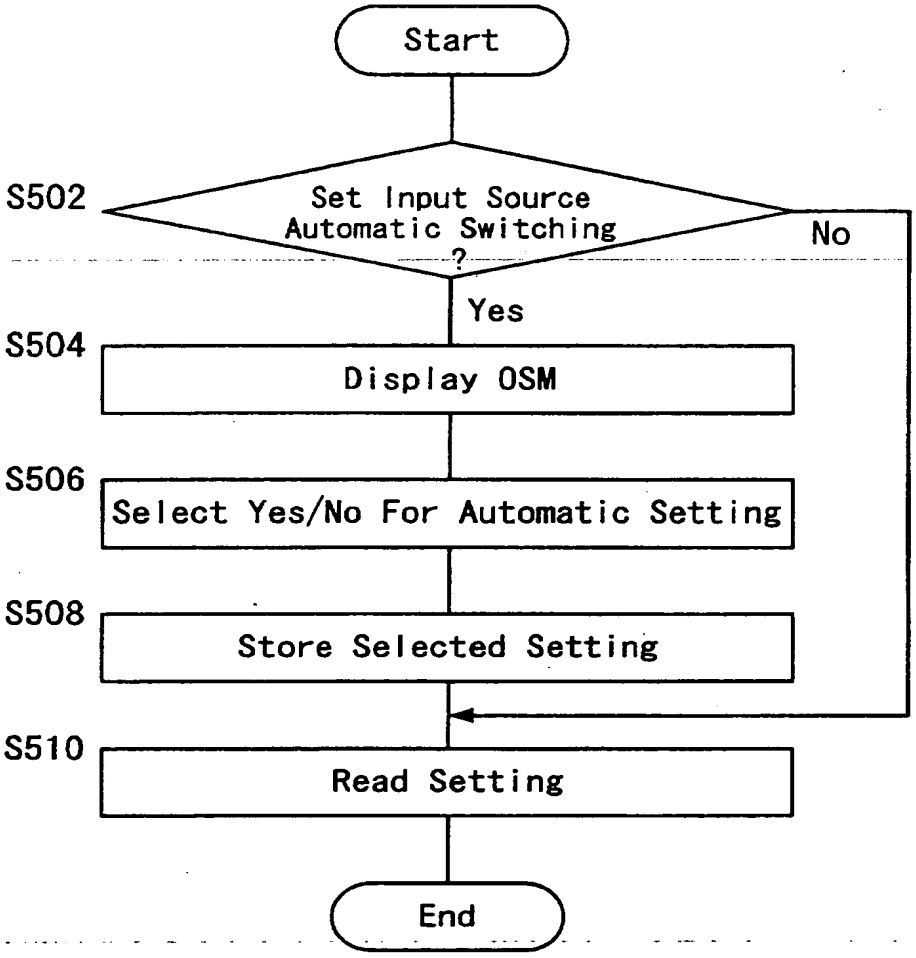
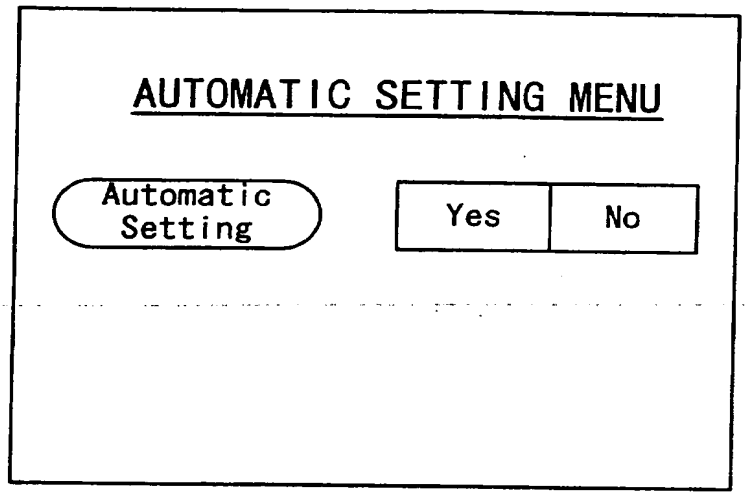


Fig. 23



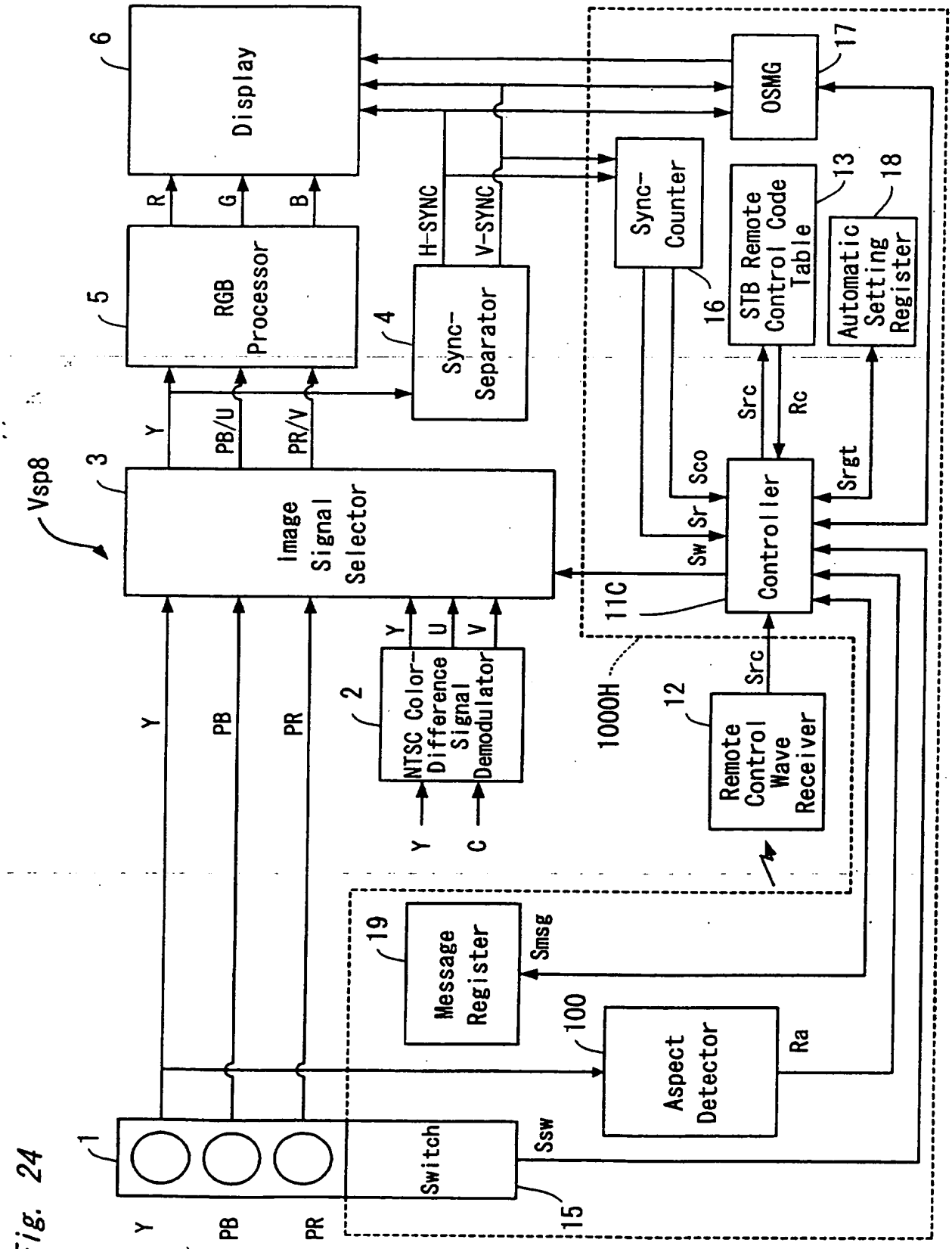


Fig. 24

Fig. 25

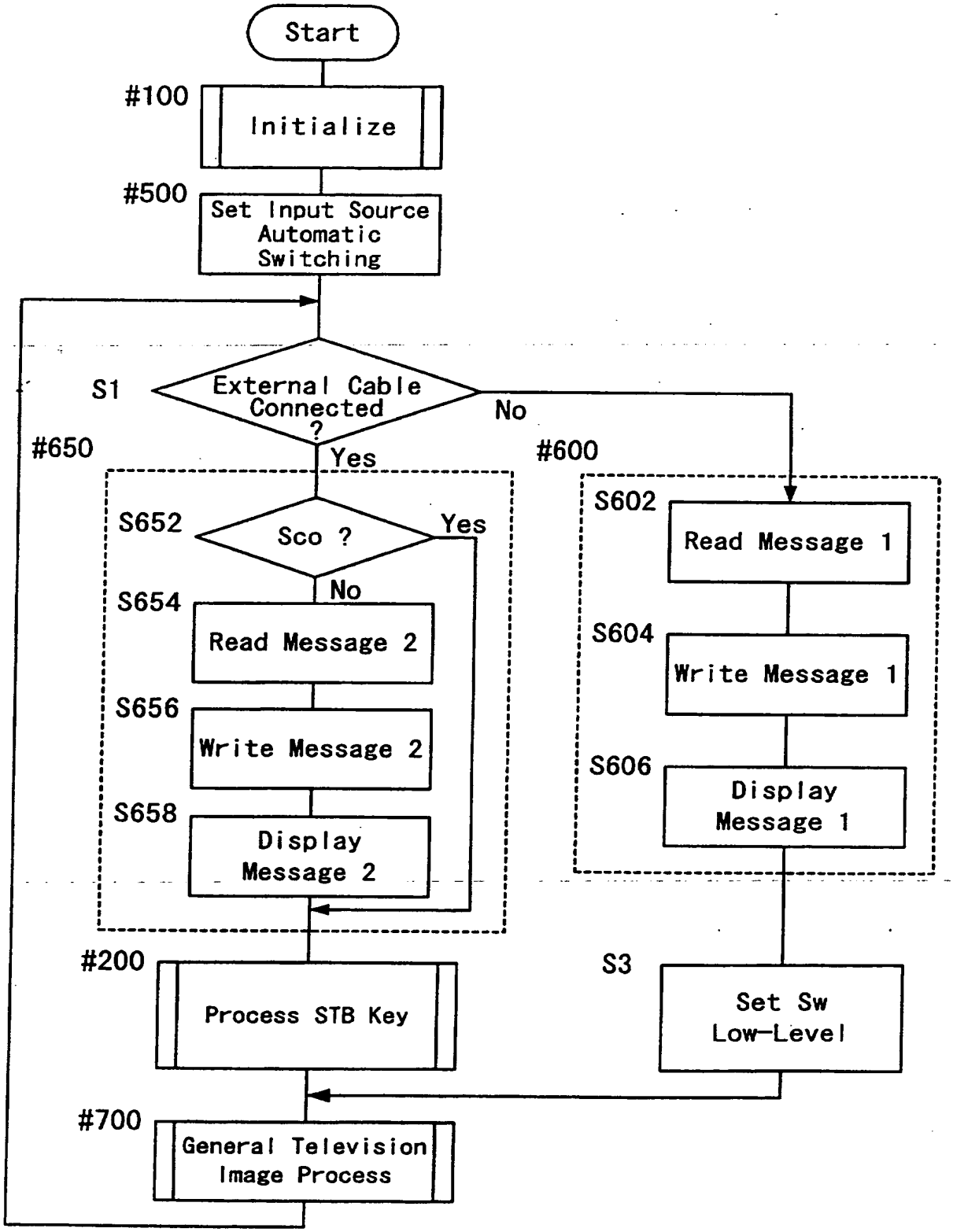


Fig. 26

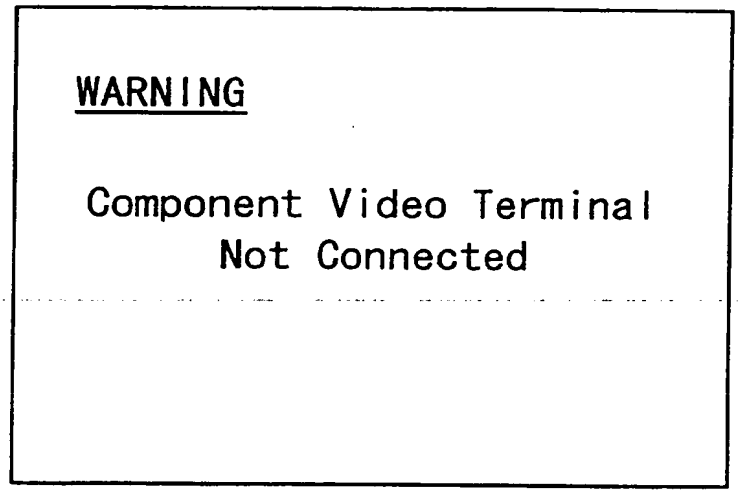
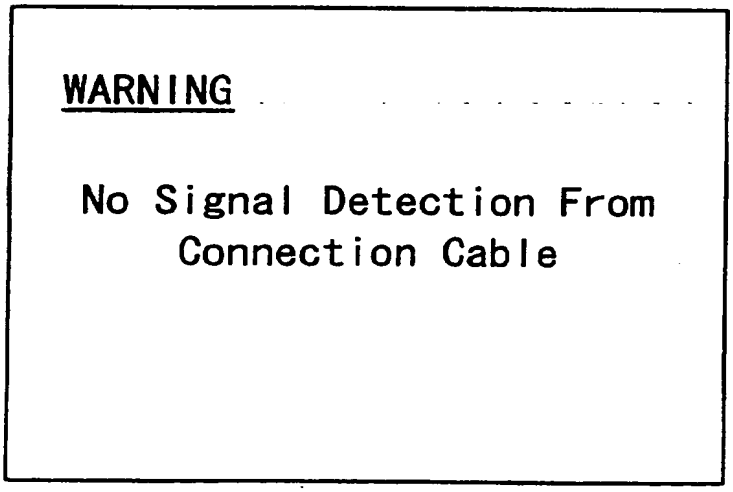

WARNING
Component Video Terminal
Not Connected

Fig. 27


WARNING
No Signal Detection From
Connection Cable

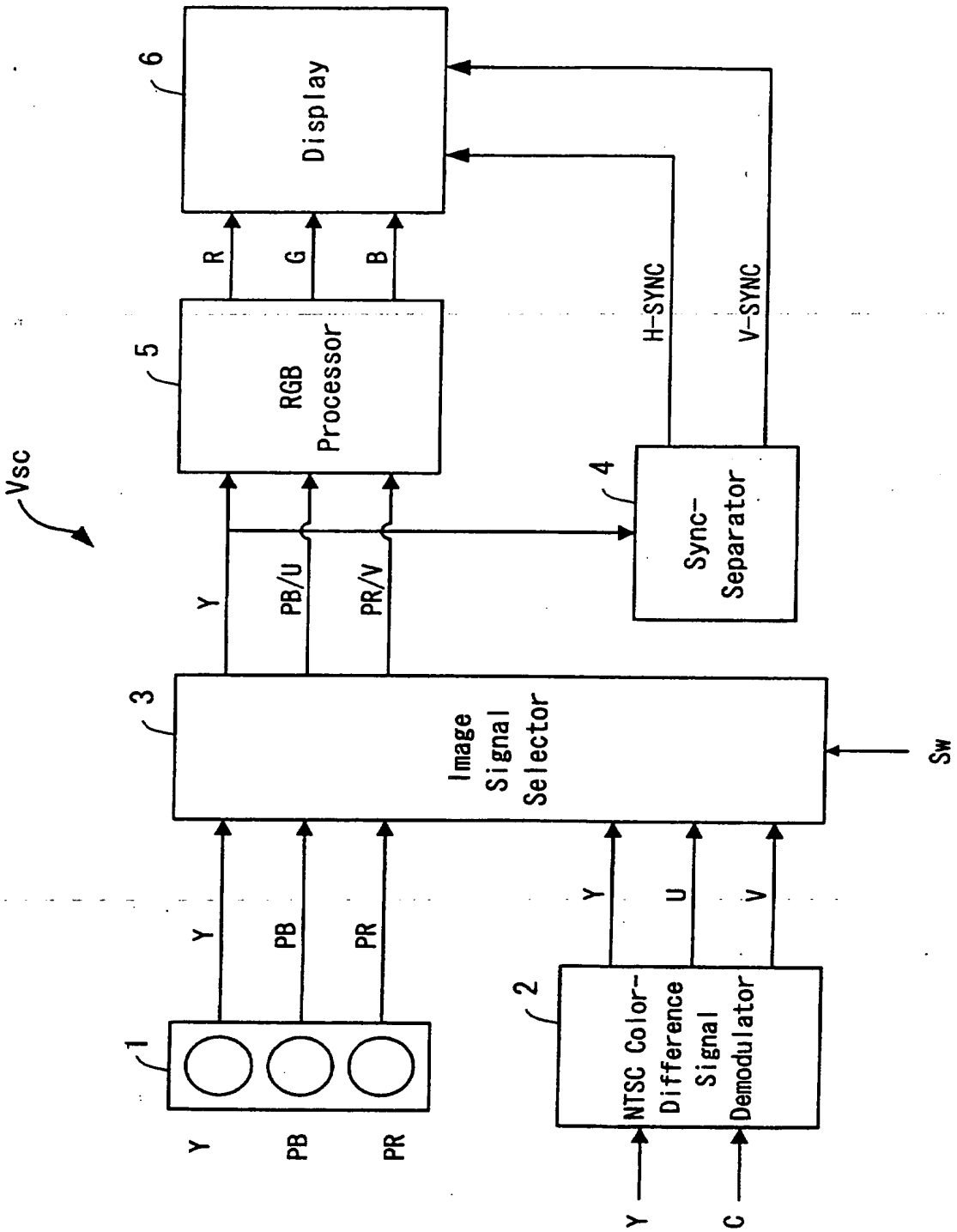


Fig. 28